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ABSTRACT

A survey was conducted to study the interactions between higher education and business in the United Kingdom, updating previous surveys, and capturing the key outputs of such interactions, taking into account the institutions' differing missions, strategies, capacities, and expertise. Additional purposes were to quantify a baseline for the activity that has developed in higher education institutions, to establish and test indicators that might inform decisions on targeted funding for knowledge transfer activities, and to assess the opportunity costs of this kind of survey against the usefulness of the data collected. The population surveyed consisted of 168 institutions (universities established before 1992, those established after 1992, and higher education colleges), and the total response rate was 89%. Information was collected about institutional strategies to support economic development, something about which institutions were very positive. Sponsored and collaborative research continues to grow, reaching about 2 billion British pounds invested in the 1999-2000 academic year. Higher education institutions also reported significant growth in invention disclosures and patents since the previous survey. Many higher education institutions have been formalizing their policies on consulting, attempting to regulate consulting by individuals and encouraging consulting within the academic contract. There has also been a growth in "spin-off" firms in which higher education institutions or their employees have equity stakes. The core activities of providing training

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remain important areas of interaction with business, and student placements with business continue to be a key means of building employability skills and linking with employers. Higher education institutions also responded that most are involved in some form of economic regeneration activity. In general, the higher education community supported the activities and conduct mentioned in the survey. Findings suggest that institutions need to take a more strategic view of some interactions, and that the government must take into account the varied nature of interactions between higher education and business. The survey questionnaire is attached. (Contains 38 tables, 21 figures, and 18 references.) (SLD)

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December
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Research report

Higher education-business interaction survey

A report by the Centre for Urban and Regional Development Studies, University of Newcastle upon Tyne

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Higher education-business interaction survey

A report to the UK HE funding bodies and the Office of Science and Technology

David Charles

Cheryl Conway

December 2001

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The survey and this report were commissioned by the Higher Education Funding Council for England on behalf of a wider group of stakeholders, including the Department of Trade and Industry/Office of Science and Technology (DTI/OST), the Department for Education and Skills (DfES), and the other UK higher education funding bodies. The survey and report were produced by CURDS and the conclusions and recommendations are those of the authors.

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Peter Clark, DfES

Richard King, OST

Hugh McAloon, Scottish Executive

With additional inputs from Robin Jackson of Universities UK

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Acknowledgements 2

Executive summary 5

Purpose and design of the survey 5

Institutional strategies 6

Collaborative research 6

Intellectual property 7

Consulting activities 7

Spin-off firms 8

Training and personnel links 8

Regeneration 9

Data collection and recommendations for future surveys 9

1 Introduction 11

1.1 Purpose and design of the survey 11

1.2 Methodology and response rate 12

2 Forms of HE-business interaction 17

2.1 Rationale for HE-business interaction 17

2.2 Forms of interaction 17

2.3 Public programmes to encourage HE-business interaction 19

3 Institutional strategies 22

3.1 Contributions to economic development 22

3.2 Regional economic development 24

3.3 Focus on particular sectors 26

3.4 Benchmarking institutional strategies 29

3.4.1 Strategic plan for business support 30

3.4.2 Involvement in regional skills strategies 31

3.4.3 Incentives for staff to engage with business 32

3.5 Business representation on HEI governing bodies 34

3.6 Support for interaction with business 35

4 Collaborative research with business 36

4.1 Research income 36

4.2 Contract research income from business 37

4.3 Collaborative research grants 39

4.4 Contracts with SMEs 41

4.5 Research students and Teaching Companies 43

4.6 Equipment services 45

5 Managing intellectual property _____ *48*

5.1 Disclosures _____ **48**

5.2 Patenting _____ **49**

5.3 Comparison with North America _____ **52**

5.4 Licensing _____ **53**

5.5 Revenues and costs _____ **54**

5.6 IP policy _____ **57**

6 Consulting activities _____ *59*

7 Spin-off firms _____ *63*

7.1 Categorising spin-offs and start-ups _____ **63**

7.2 Spin-offs _____ **63**

7.3 Staff start-ups _____ **65**

7.4 Graduate start-ups _____ **65**

7.5 Managing the process _____ **66**

8 Training and personnel links _____ *67*

8.1 Benchmarking contribution to the labour market _____ **67**

8.2 Placements _____ **69**

8.3 Business oriented courses _____ **70**

9 Regeneration _____ *73*

9.1 Involvement in regeneration programmes _____ **73**

9.2 Role of regeneration programmes _____ **74**

10 Issues of data collection and the development of systems _____ *79*

10.1 Appropriateness of survey _____ **80**

10.2 Burden _____ **82**

10.3 Standardisation _____ **84**

10.4 Specific questions _____ **85**

10.5 Format _____ **88**

11 Recommendations for future surveys _____ *89*

References _____ *92*

Tables and figures _____ *94*

Annex A The survey questionnaire _____ *97*

Acronyms _____ *114*

Executive summary

Purpose and design of the survey

This report provides the analysis of a survey commissioned by the Higher Education Funding Council for England (HEFCE) on behalf of a wider group of stakeholders including the Department of Trade and Industry/Office of Science and Technology (DTI/OST), the Department for Education and Skills (DfES) and the other UK higher education funding bodies.

The survey had four main objectives:

- To update previous surveys of interactions between higher education (HE) and business covering the whole of the UK; and to capture the key outputs of such interactions, taking into account differing institutional missions, strategies, capacities and expertise.
- To quantify a UK baseline for the significant level of activity which has developed in higher education institutions (HEIs), and from which improvements in later years could be measured.
- To establish and test the robustness of selected indicators which might later inform decisions on further targeted funding for knowledge transfer activities.
- To assess the opportunity costs of an annual survey against the value and utility of the data collected.

Previous surveys were carried out in the mid to late 1990s by Tartan Technology and by Policy Research on Engineering, Science and Technology (PREST) at the University of Manchester. The last of these related to the academic year 1996/97, whilst the current survey updates this to 1999/2000.

Since the last survey, significant additional government support has been provided across the UK for HE-business interaction. In England and Northern Ireland there is the Higher Education Reach-Out to Business and the Community (HEROBC) scheme, and UK-wide initiatives such as University Challenge and Science Enterprise Challenge, and the Higher Education Innovation Fund from 2001. In parallel, in Scotland a new Knowledge Transfer Grant has been introduced by the Scottish Higher Education Funding Council, building upon an earlier 'professionalisation of commercialisation' grant scheme. The Higher Education Funding Council for Wales also has its own programmes, such as the Higher Education Economic Development Fund.

The project involved a comprehensive survey of all HEIs (universities and HE colleges) within the UK, using a self-completion form covering both quantitative and qualitative indicators. The total population to be surveyed consisted of 168 institutions primarily funded by the UK HE funding bodies. Total response rate was 89%. Responses were analysed in three categories: the 'old' pre-1992 universities; 'new' post-1992 universities created by the 1992 Further and Higher Education Act; and higher education colleges.

Institutional strategies

HEIs were very positive about the need to support economic development, with different institutions tailoring their strategies to their particular strengths and regional needs. Whilst all institutions emphasised their contribution through access to education, research-intensive universities focused on research collaboration and technology transfer, and HE colleges were more focused on meeting regional skills needs and supporting SMEs. Sixty per cent of HEIs said that the economic development of their region was a high priority within their institutional mission, and 87% of post-1992 universities. However the definition of the region was problematic, with institutions in the South and Midlands being less inclined to identify with government-defined regions and more inclined to define their own boundaries.

A sector focus is also emerging within business interaction, largely driven by patterns of institutional expertise but also in response to demand from companies, and for at least one-third of HEIs in response to regional strategies.

Using process benchmarks for assessing strategies towards business, contribution to regional skills strategies, and incentives for staff to engage with business, most institutions considered themselves to be making some significant contributions, although few positioned themselves at the good practice end of the scale. Clearly there is scope for further development.

One element in these strategies is the development of units with specialist staff to support commercialisation. Only 8% of HEIs, mainly HE colleges, employed no staff in this role, and a total of 1,217 staff were identified across the sample. Given that the figures were for 1999/2000 (and therefore do not include recent growth in such activity) and excluded staff in departments, this shows that significant resources are being devoted to interaction across the sector.

Collaborative research

Sponsored research continues to grow, reaching about £2 billion in 1999/2000, an increase of 7.7% on the previous year. Of this, 12.3% or £242 million was from UK business, with business's contribution to total research income increasing from 10.9% in 1995/96. This proportion is slightly higher than in the US, although obviously much smaller in absolute terms.

Detailed information on the sources of industrial research income was difficult for HEIs to provide. Those that could gave estimates suggested that only 19% of business research contracts were from within the same region as the HEI. Similarly, more than 60% of the HEIs reported that less than a quarter of contracts were with small and medium enterprises (SMEs). Over 80% reported that less than a quarter of research income from business was from SMEs, although only a minority of HEIs were able to provide estimates.

An important element of research collaboration with industry was in Office of Science and Technology/research council or EU programmes where business was a partner or collaborator. Again HEI information systems do not easily provide this data but this could be of a similar scale to direct industrial funding.

Other schemes such as postgraduate studentships and Teaching Company Schemes (TCS) also provide valuable support for business and are much more likely to be regionally based. For TCS, 550 out of 734 projects reported by respondents were with regional partner firms, and this scheme was also more broadly distributed across pre- and post-1992 universities.

Intellectual property

HEIs reported significant growth in invention disclosures and patents since the previous survey in 1996/97, and strong growth also between 1998/99 and 1999/2000. Invention disclosures, although more likely to be monitored by the more research-intensive universities, increased from 1,684 in 1998/99 to 1,912 in 1999/2000, an increase of 13.5%.

Total patents filed also increased markedly over the two years, from 1,259 to 1,534, a growth of 22% in one year. These figures are also significantly higher than those reported in 1996/97 although differential response rates make direct comparison unreliable. New patents as a component of this were also markedly up, with a 12% increase in the year to give a total of 705 in 1999/2000.

The numbers of patents granted were much smaller as a consequence of various filtering processes, with only 162 granted in 1998/99 and 188 in 1999/2000.

Successful patent activity was quite concentrated among the more research-intensive universities, with 238 non-software licences granted by HEIs in 1999/2000, of which over one-third were from just five institutions. Relatively few institutions reported revenues from intellectual property that were higher than the costs.

Comparing patenting performance with US and Canadian universities, the UK sample performed well. Calculating the average value of research expenditure from external sources per patent, the UK HEIs needed less income per patent than universities in the US or Canada. US universities filed one new patent for every £2.9 million, whereas UK universities filed one new patent for every £2.4 million. However the research expenditure benchmark for patents issued was much higher in the UK than in North America.

Consulting activities

Many HEIs have been formalising their policies on consulting, seeking to regulate the amount of consulting carried out by individuals, developing schemes to encourage greater consulting within the academic contract, and formalising individual consulting through the provision of legal liability insurance. Eighty-eight per cent of all universities have a commercialisation company and/or an internal commercialisation department to manage consulting links, although over 40 % of HE colleges did not.

Many institutions are only able to provide limited data on the numbers of firms assisted, and the income associated with this, as much of the activity is not centralised. Even where it is centralised there may be considerable activity which is just not declared. Eighty-eight HEIs were able to provide estimates of the numbers of firms assisted through consulting for 1999/2000, polarised between those reporting very few links, and those reporting hundreds of companies assisted.

The total income from all HEI respondents for 1998/99 was £51.8 million, increasing to £60.2 million in 1999/2000. For various reasons this is much smaller than the real total income, partly due to the difficulties of estimating actual levels of consulting, and partly due to the low response rate for this activity.

Spin-off firms

'Spin-offs' are enterprises, in which an HEI or HEI employee(s) possesses equity stakes, which have been created by the HEI or its employees to enable the commercial exploitation of knowledge arising from academic research. Other 'start-up' companies may be formed by HEI staff or students without the direct application of HEI-owned intellectual property.

HEIs responding to the questionnaire reported a total number of 199 firms established in 1999/2000 where there was some form of HEI ownership or HEI intellectual property involved. Ninety-two per cent of these involved some form of HEI ownership. The spin-offs were concentrated in a relatively small number of HEIs: during 1999/2000 only 24 had seen more than two spin-offs with HEI ownership, and these accounted for 136 of the 183 reported. In the previous five years 338 were reported, just under 70 a year, suggesting a significant increase in the rate of formation in the last year or so. Only 45 HEIs declared equity holdings, totalling almost £194 million.

Eleven institutions reported income from the sale of shares in spin-offs during 1999/2000, for a total income of £38.4 million. Again this was mainly attributable to an even smaller group of institutions, with only three accounting together for over 80% of this total.

In comparison with universities in the US and Canada, UK universities identified a total of 199 spin-off firms in 1999/2000 – one for every £8.6 million of research expenditure. Canadian universities in 1999 created one spin-off firm for every £13.9 million, whilst in the US only 275 were identified, with a ratio of one for every £53.1 million of research expenditure. These figures seem to confound the received wisdom that UK HEIs are much less entrepreneurial than their North American counterparts. However, they should be treated with some caution as we do not know the relative success of these companies in the market.

Few institutions were able to identify graduate start-ups, as schemes to promote graduate entrepreneurship have really only begun to flourish since 1999. This indicator should show rapid growth in future. Around half of HEIs now offer incubators either on or off campus for staff or student companies, and over 70% have access to seed corn investment provided either by the HEI or by a partner.

Training and personnel links

Important areas of interaction with business remain the core activities of providing a supply of trained graduates, and providing general and bespoke training courses for businesses.

Benchmarking questions revealed a moderate use of labour market intelligence to monitor skills needs, but a more positive engagement with employers in curriculum development.

Student placements in businesses are a key means of building employability skills and linking with employers, but are typically not well tracked at a central level within institutions. HEIs found it difficult to provide accurate data on numbers of placements, although this is also due to definitional problems. The most important mechanism for arranging placements was at school or department level, with the careers services and ad hoc means also being significant.

Often a more direct relationship between the HEIs and business is in providing courses designed to meet the needs of particular groups of businesses. In general, HEIs were least likely to offer standard undergraduate degrees or degree modules tailored to meet the needs of specific businesses (less than 40%), and were much more likely to offer sub-degree or masters level qualifications developed specifically for businesses. However, non-accredited courses were most commonly offered, with almost 90% of post-1992 universities running such courses.

Regeneration

Most HEIs are now involved in some form of economic regeneration activity, albeit varied by location and access to different programmes. Overall, respondents identified £148 million of income from European Structural Funds, the Single Regeneration Budget and other schemes, although a significant minority of institutions were unable to supply figures.

The principal reasons for participating were reported to be additional funds for teaching and training, building strategic links with local industry, fulfilling the regional mission through new services to industry, and facilitating partnerships. Again there were differences in orientation among different types of HEIs and between regions.

Participation in the programmes is not without problems however, and HEIs do struggle with the burden of regulations and financial complications of these schemes, particularly the requirements to provide matching funds.

Data collection and recommendations for future surveys

In general there was support within the HE sector for the objectives of the questionnaire, in terms of measuring the nature and scale of business interaction and communicating that. It was felt that investigations of this kind were appropriate, subject to the nature of the specific questions and indicators, their timing and their use.

Within the HEIs there was a growing need for better data on enterprise links and performance data, for management concerned with the implementation and monitoring of policies on commercialisation and working with business. Several respondents responsible for business development found the questionnaire useful to support their own needs for better data. Often the questionnaire showed up existing data collection inadequacies, where HEIs have typically invested in systems that deliver only what is required by the HE funding bodies and no more.

The questionnaire exposed weaknesses in data collection and management, especially a lack of centralised data. A common problem was the need to gather information currently held only at the faculty or department level.

This prompted two main critiques: first, whether the factual indicators are the most appropriate; the second whether the qualitative indicators reflect an appropriate model of business interaction, and whether they accurately reflect the state of strategy in the individual institutions.

The biggest issue was the concern over individualised data and its publication. There were concerns that the indicators would become another league table, trivialising some approaches at the expense of others and artificially setting the business agenda around a set of indicators that may not be appropriate as objectives.

A specific concern in designing the questionnaire was the time and effort needed to complete it. Some of the questions required detailed and disaggregated data, which would only be easily available if systems were already in place. The 102 HEIs who could provide estimates spent a total time of 2,501 hours completing the questionnaire. At a 'reasonable' average cost per day of £300 this would give a total cost of perhaps £150,000 for a full response from all HEIs.

For HEIs to provide accurate and timely information in future, they will need to invest in data collection and storage. They therefore need a clear statement of future data requirements. This should include specifications of what data needs to be collected and how, and an appropriate timetable for implementing the necessary changes.

Some data could be standardised and provided to the Higher Education Statistics Agency (HESA). This would make the collection process more mechanistic and so reduce the burden compared with ad hoc surveys.

Ultimately we recommend that the questionnaire is partly replaced by the formal collection of a limited set of hard indicators by HESA, as part of the annual financial return.

Such data will then be published for each HEI, so should not relate to any other organisation linked with the HEI (such as a spin-off company).

Qualitative indicators and questions are still useful for developing appropriate policies for the sector, and could be continued through an annual questionnaire that might change slightly from year to year.

HEIs also need to take a more strategic view of some of interactions examined in this report. Although business interaction is recognised as an important part of the mission, and is an important source of funds, it is still managed as a marginal activity. HEIs plan and manage their business primarily on the basis of core funding streams, with activities such as those examined in this survey treated as additional, volatile and managed on a self-contained basis.

For government, the implication of the survey findings is that there is a very varied approach to business interaction, with some traditional forms of business collaboration essentially limited to very few institutions. This suggests extreme caution is needed in setting narrow models of business interaction, or applying only a few indicators, or directing funds to particular categories of HEIs. The achievement of benefits for the UK as a whole, and all its constituent elements, will depend on an inclusive approach that recognises and supports this diversity.

1 Introduction

1.1 Purpose and design of the survey

This report provides the analysis of a survey commissioned by the Higher Education Funding Council for England, on behalf of the four funding bodies for UK higher education[1] and the Office of Science and Technology.

The survey had four main objectives:

- To update previous surveys of interactions between higher education (HE) and business, covering the whole of the UK; and to capture the key outputs of such interactions, taking into account differing institutional missions, strategies, capacities and expertise.
- To quantify a UK baseline for the significant level of activity which has developed in higher education institutions (HEIs), and from which improvements in later years could be measured.
- To establish and test the robustness of selected indicators which might later inform decisions on further targeted funding for knowledge transfer activities.
- To assess the opportunity costs of an annual survey against the value and utility of the data collected.

Previous surveys were carried out in the mid to late 1990s by Tartan Technology and by Policy Research on Engineering, Science and Technology (PREST) at the University of Manchester (Howells et al, 1998). These provided data on patterns of business interaction, on the motivation for such interaction, and on the overall scale of activity within the HE sector. The last of these surveys related to the academic year 1996/97; the current survey updates this to 1999/2000.

Since the last survey, significant additional government support has been provided across the UK for HE-business interaction, as a third stream of public funding alongside those for teaching and research in higher education. During 1999/2000 the Higher Education Reach Out to Business and the Community (HEROBC) scheme was launched in England and Northern Ireland, building upon UK-wide initiatives such as University Challenge and Science Enterprise Challenge (SEC). This stream of work is to be taken forward in the Higher Education Innovation Fund from 2001. In parallel, in Scotland a new Knowledge Transfer Grant has been introduced by the Scottish Higher Education Funding Council, building upon an earlier Scottish Technology Ventures Initiative as well as SEC and other UK-wide programmes. Education and Learning Wales also has its own programmes, such as the Higher Education Economic Development Fund, whilst in Northern Ireland there is a series of specific projects developed between the two universities and government bodies.

It is anticipated that such schemes will lead to increases in interaction over subsequent years, with 1999/2000 being the baseline year before the impact of the new programme begins to be realised. The future development of this third strand of funding will require ongoing monitoring of outcomes, but also decisions about new indicators and the suitability of existing indicators for assessing desired outcomes. This issue about the robustness of indicators has two dimensions: first there is the question of the accuracy of the data supplied for the indicators and hence their practicality in terms of repeatability; second is the question of whether the indicators are a reliable proxy for the phenomenon we wish to understand. This study examined these issues through the application of the questionnaire and associated discussions with HEI representatives.

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[1] The Higher Education Funding Council for England (HEFCE), the Scottish Higher Education Funding Council (SHEFC), the Higher Education Funding Council for Wales (HEFCW), and the Department of Employment and Learning (DEL) in Northern Ireland.

Finally, as part of the project, the burden placed on the HE sector in responding to the questionnaire has been examined in order to assess the future costs of annual surveys and the relative benefits to the sector of providing such data.

1.2 Methodology and response rate

The survey sought to build on previous surveys, and notably that undertaken by PREST in 1998. Thus the sponsors required a comprehensive survey of all HEIs (universities and HE colleges) within the UK using a self-completion form covering both quantitative and qualitative indicators.

The total population to be surveyed consisted of 168 institutions primarily funded by the UK HE funding bodies. This number – slightly less than in the previous survey – is not fixed or unambiguous, as there are a number of factors affecting the total:

- At any one time a number of institutions are in merger negotiations. Several HE colleges have recently merged with nearby universities, often to provide specialist units such as schools of art. In addition, within London there is an ongoing process of rationalisation, with independent colleges within the University of London merging to form what are effectively large multi-purpose universities.
- One institution was in the process of transferring from being funded by a government department to being supported by a funding body.
- Within London some of the smaller units are managed by the university centrally, although the extent to which they should be included is not a clear division.

Overall we can expect a long-term reduction in the number of institutions. From a volume perspective many of the smaller colleges make a very small contribution to the aggregate picture, although they may be effective in their own right.

A complete listing of funded institutions was obtained from the funding bodies; and the address and name of the vice-chancellor or principal was obtained from Universities UK, the Standing Conference of Principals (SCOP) and direct examination of institutional websites.

A single questionnaire was drawn up to be sent to the institutional head, with a parallel circular from the funding bodies advising HEIs of the survey and requesting co-operation. The decision to use a single questionnaire rather than the two used in the previous survey was to simplify and unify the requirements. The previous survey had a slightly different response for the two questionnaires. However it was recognised that the various information requests would need inputs from different departments or units, so it was designed as a set of modules that could be handed out to different people and then re-assembled.

The questionnaire was designed to permit some continuity with both the PREST survey and the previous surveys by CURDS for the then Committee of Vice-Chancellors and Principals (CVCP) and the Department for Education and Employment (DfEE). In addition, the questionnaire was harmonised with the US Association of University Technology Managers (AUTM) survey on intellectual property to enable some international benchmarking. Finally, arising from a parallel study by CURDS for the HEFCE on the regional contribution of HE (Charles and Benneworth, 2001a), some questions from a benchmarking tool on HE regional engagement were included (Charles and Benneworth 2001b). The whole draft questionnaire was sent out to a sample of HEI industrial liaison managers for comment, including representatives of the University Companies Association (UNICO). Comments were also obtained from a steering group representing the funding units, key government departments, HE and the devolved administrations.

The questionnaire was sent out to the HEIs via the vice-chancellor or principal in February 2001, with an initial target submission date of 31 March. A number were returned within the allocated time; a reminder letter was sent out in April to encourage a further response, followed up by telephone reminders. A small number of HEIs were still completing their questionnaires in June and July. We particularly focused on the universities in the final stages, and on those institutions whose volume of activity was likely to have an influence on the sector totals, so the response rate for the university sector is higher than for colleges. In parallel, a sample of 25 HEIs were approached for telephone interviews about the burden of completion, which also stimulated responses.

By mid-July we had received 141 completed questionnaires and a further 7 responses where, for a variety of reasons, institutions felt that the survey was inappropriate for them to complete. Another response came in later and was used in some questions only, as it was too late to recalculate all tables. Overall, this gave us a total response rate of 89%.

Table 1.1 Response characteristics

	University			HE college			
Location	Actual	Response	Response rate	Actual	Response	Response rate	Total response rate
England	84	79	94%	48	38	79%	89%
Scotland	13	12	92%	8	6	75%	86%
Wales	8	7	88%	5	5	100%	92%
N.Ireland	2	2	100%	0	0		100%
Total	107	100	93%	61	49	80%	89%

Questionnaires were initially sent out in printed format, but a downloadable version was also made available on a CURDS website concerned with issues of HE-regional engagement. Respondents were asked to return questionnaires either by post or as email attachments. A relatively high proportion took up the opportunity to reply electronically, and often those that made a postal return had entered their data into an electronic version of the form. To facilitate this process the questionnaire was issued in a relatively simple form, as a Microsoft Word document with tick boxes and tables for data entry.

Another formatting issue was the treatment of the devolved territories. An additional aspect of the questionnaire was the regional perspective: the regional scale was taken to be that of the devolved territories of Scotland, Wales and Northern Ireland plus the nine English Regional Development Agency (RDA) regions. These are roughly comparable, with Scotland and Wales being directly comparable in size to English regions whilst Northern Ireland is two-thirds the size of the smallest English region. In order to avoid ambiguity over the terms national and regional, separate questionnaires were provided (and hosted separately on the website) for England, Scotland, Wales, and Northern Ireland, with slight variations in wording to ensure comparable responses.

In considering the results of the survey it is important to recognise the diversity of institutions, contexts and approaches used. HEIs have evolved from a variety of different backgrounds. Levels of specialisation vary, as does the emphasis on research and historic endowment. These variables will affect their capacity to engage in particular forms of strategy. HEIs in different regional locations will also face different levels of opportunity for business interaction according to the vibrancy of the local economy and the degree of fit between the strengths of the HEI and the composition of the local economy. HEIs may also adopt differentiated strategies.

Accordingly, rather than simply analysing the response as a single group, the sample can be split up in different ways to examine the nature of this diversity.

In terms of the type of institution, there is a clear distinction between a large research-based university with a medical school, and a small HE college specialised around arts disciplines. What is problematic, however, is the dividing lines and choice of parameters. One categorisation can be made based on research intensity. This has a strong overlap with a categorisation based on institutional history: pre-1992 universities, post-1992 universities, and HE colleges. In the analysis we have used this institutional categorisation because of its ease of implementation, and familiarity to most readers, although there are some concerns about whether this might be seen as reinforcing traditional stereotypes dating back now 10 years.

It is important to stress two points in arguing for the value of this institutional split. First, although the university sector has been unified for nearly 10 years, there remain significant quantitative and qualitative differences in aggregate between the pre- and post-1992 institutions. Chief among these is research income as a share of total income. Leaving aside small specialist colleges within the University of London, there are very few pre-1992 universities with a lower level of research intensity than the most research-intensive of the post-1992 universities. Greenwich, as the most research-intensive of the post-1992 group, has a higher percentage of income from research than universities such as Bradford, Hull and Brunel. Also universities such as Abertay, Plymouth and De Montfort have a greater proportion of research income than City, Salford and the Open University. There is thus some convergence in performance between the more research-active post-1992 universities and some of the older institutions. However, the differences are more striking in the big cities, where the old civic universities typically earn well over 10 times the research income of the neighbouring new universities, despite similar or even lower student numbers. Furthermore there is a break-point between the two groups of institutions in terms of aggregate Research Assessment Exercise score using the 1996 results.

Second, the process of incorporation for the post-1992 universities led to a number of differences in governance and management structures between them and existing universities. Some of these differences are brought out in the response to questions later in the report. Consequently post- and pre-1992 universities tend to respond differently when asked about the role of the region in their mission. Post-1992 universities identify themselves as primarily serving their region whilst also seeking to develop an international research mission. Pre-1992 universities see themselves as international research universities that seek to serve their region where it does not conflict with this international mission (CURDS survey, 1997).

The implementation of this categorisation is relatively straightforward for most institutions. However, we did decide to allocate a couple of London University colleges to the HE college sector due to their specialist focus, and low research income. The majority of London University institutions were included in the pre-1992 sector.

Another way of looking at institutions is by region. There are 12 regions in the UK, with varying size and number of institutions. These regions can be collapsed into four categories representing degrees of regional autonomy and core-periphery character. A first grouping is to combine the three devolved territories, where there are separate funding arrangements, long-established Regional Development Agencies, a strong sense of identity, 'peripherality' and long-standing regional funding. Applying these same criteria to the English regions, the three northernmost regions also share many of the economic problems of peripherality and industrial decline, have a strong sense of regional identity, and have a longer history of HEI collaboration through regional consortia. At the opposite extreme, London, the South-East and East essentially form one regional system, with a concentration of research activity in the public and private sector, a highly dynamic economy, a low regional identity and relatively weak regional collaboration due to the absence of regional funding and the sheer numbers of HEIs involved. Finally the two Midlands regions and the South-West are hybrid regions, with a combination of dynamic and lagging local economies, an emerging sense of regional identity and need for regional collaboration among HEIs, but with strong internal divisions.

These kinds of divisions between regions in the UK are quite conventional among regional development researchers, and the rationale appears to be justified by the results for some of the questions, where despite considerable variations between regions there is much less variation within the groupings proposed. This suggests that these groupings are relatively robust for the current purpose.

There are other ways of segmenting the population of HEIs. The pre-1992 universities can be divided up in various ways, the most common of which is to separate out the Russell Group of large research-based universities with medical schools, comprising Oxford and Cambridge, the big London University colleges, and the civic or redbrick universities. This group does account for the largest share of research income, but excludes some 1960s universities with high levels of research activity and active business engagement. It was decided not to add this division to the existing three-way split of institutions.

We also considered using some of the indicators from the survey as a means of classifying HEIs. So for example the benchmarking questions used in the survey, where institutions were asked to grade their practices, could be used to give a classification of proactivity towards business interaction. A ranking was produced to assess the viability of this approach. However, there appeared to be some variation in the level of self-criticism applied, and we felt concerned that some institutions might be placed in a higher or lower category depending on how seriously they considered a question and whether they had given an over-optimistic or self-critical response. We therefore decided not to use this categorisation in the analysis.

2 Forms of HE-business interaction

2.1 Rationale for HE-business interaction

Measures to encourage interaction between higher education and business have a long history in the UK, some with a distinct regional or local dimension. Currently there is a rather complex mixture of national and local measures: some originating from previous programmes and initiatives, some having continued over many years, and some newly established. Indeed the history of policy to encourage university-industry engagement is one of constant change and a rapid stream of new initiatives, especially since the early 1980s.

In recent years there has been a steady increase in the focus given to industrial collaboration within public funding for research. Prior to the 1980s there was modest involvement of industry in programmes funded by the research councils, but the early 1980s saw the formation of the Alvey Programme as a significant attempt to ensure that UK industry and academia caught up with the US and Japanese lead in IT. Alvey funded pre-competitive collaborative research, often involving academic and industrial partnerships, with the academic element being met by additional funding from the Science and Engineering Research Council. Soon SERC (later EPSRC) and the other research councils were launching further schemes to encourage collaboration with industry, and many of these were brought together under the LINK programme of the late 1980s and into the present.

Also during the 1980s there was a growing awareness of the potential role of universities in economic development through better exploitation of their knowledge base. This was either by transferring expertise and inventions to the private sector to enhance growth opportunities, or by establishing new companies to exploit the ideas that were perceived to be emerging from universities. As a consequence there was a rapid growth of science parks and technology transfer agencies and initiatives, in part driven by the need for universities to seek new revenue-generation opportunities, but also driven and funded by national and regional stakeholders keen to see a benefit for the UK and its local economies.

2.2 Forms of interaction

As HEIs have developed links with business over recent years, the forms of those links have become more varied and sophisticated. New public programmes have been introduced to stimulate different approaches, and individual HEIs have initiated new schemes.

The types of interaction can be grouped into four broad categories (Charles and Howells, 1992), albeit that there may be overlaps and interactions between them:

- **Research-based services** – focused around the creation of new knowledge through sponsoring research projects and collaborating in the use of scientific and technical facilities.

- **Exploitation of existing knowledge** – incorporating the application of codified knowledge in the form of patents and copyright, as well as the application of knowledge and expertise through consultancy.
- **People-based mobility and exchange schemes** – including the exchange of students and personnel between the HEI and the companies, as a means of transferring knowledge.
- **Spin-offs and forming new companies** – including schemes to encourage graduates to establish companies and support infrastructures such as science parks and incubator units.

Research is a central activity of higher education in the UK, with the sector accounting for 20% of total UK R&D effort. A significant amount of this is funded through competitive grants and contracts, mainly provided by government, but with a proportion from business organisations. Such contract research activity is growing in most advanced countries, promoted by government encouragement and support, but also by trends towards the greater externalisation of contracting out research.

Our concern in this study is two-fold: direct research commissioned, funded and to the benefit of business, and collaborative research funded by the government in which business is a beneficiary. The nature of the different funding mechanisms is further explained in section 4.

The business sector has traditionally relied upon HE and public funding for the basic or fundamental research likely to underpin future market opportunities, although the true relationship between basic research and commercial product development is more complex and interactive. However, the relationship between government, industry and HE has arguably become more complex in recent years. Government has withdrawn from direct support for R&D in individual businesses in favour of funding collaborative work within universities where business also makes some contribution. In parallel there have been shifts within HEIs to activity that is more closely related to the needs of business, prompting concerns that business should be paying the full costs of research. Consequently we have seen growth in the numbers of research-only staff in HEIs, typically on project-related contracts, and an associated growth in externally-oriented research units focused on the needs of particular business sectors. This emergence of a research enterprise culture in HE also feeds into the question of commercialisation of intellectual property (IP).

Within the UK in recent years there has also been an intensification of the policy pressure on universities to commercialise their knowledge, and a reshaping of policy regimes to encourage this. Central to concerns about IP and spin-offs is the question of legal rights to IP, an area in which the UK law and practice of exerting ownership of IP within an academic context is highly permissive.

There are several stakeholders in the process of developing potentially exploitable IP within universities. They include the members of the research team that take the inventive step, the university which employs the individuals and may exert rights through contracts of employment, the funders of research (often government through general university funds and also specific programmes, but also charities and other bodies), and the local community served by the university. Leaving aside the issue of contracts from companies which exert rights to the IP, the question of ownership is central to appropriation and whether society in the form of the state, local community or the university benefits from the commercial exploitation (Charles and Howells, 1992).

During the 1980s there were major shifts in policy in the UK concerning the routes by which IP could be exploited, although the basic rights were largely unchanged. Prior to 1985, rights of first refusal on publicly-funded research IP went to the National Research and Development Corporation (NRDC), later renamed the British Technology Group (BTG), and royalties were split with the university. Universities could though exploit anything that NRDC refused. Subsequently, with the abolition of the NRDC/BTG monopoly, universities were free to develop their own strategies for commercialisation, but could still use BTG as one route (Charles and Howells, 1992; Harvey, 1996). A wide variety of in-house and collaborative mechanisms have since developed to encourage commercialisation activity and manage the process.

From the early 1980s there have been a growing number of Industrial Liaison Officers (ILOs) in universities, and the parallel development of science parks and other incubators, university companies, and consultancy organisations, all of which have played different roles in the exploitation of academic knowledge, mainly on a more local scale (Charles et al, 1995).

2.3 Public programmes to encourage HE-business interaction

The public policy landscape supporting HE-business interaction has become considerably more complex in recent years, through a combination of growth in national schemes targeted at universities, increased participation of universities in regional and regeneration programmes, and the effects of devolution through the establishment of parallel but distinct schemes in the devolved nations.

A core set of grant schemes and programmes to promote collaborative research, graduate placement and teaching companies has been in operation for many years. These have been accompanied more recently by the development of what is expected to become a permanent 'third strand' of funding for outreach and entrepreneurial activity.

Following the DTI White Paper in 1998, 'Building the Knowledge Driven Economy', funding was provided for the establishment of 12 Science Enterprise Centres through the SEC. They provide a focus for commercialisation and entrepreneurship, aimed at both academic staff and students through the introduction of enterprise into the curriculum. Associated with this programme, the University of Cambridge joined forces with MIT to establish a Cambridge-MIT Institute (CMI) to promote the international transfer of expertise in commercialisation. In parallel, the University Challenge (UC) initiative was established with funding from the Treasury, the Wellcome Trust and the Gatsby Charitable Foundation. UC awarded grants to a limited number of institutions (some operating in collaboration), establishing rolling funds to support commercialisation projects through seed funding. SEC and UC were both national initiatives.

In England and Northern Ireland, this selective approach was accompanied by the Higher Education Reach Out to Business and the Community (HEROBC) Fund which aimed to provide support to the majority of HEIs for the further development of business interaction. HEROBC was launched during 1999 with a first tranche of £60 million awarded for three-year projects in 87 institutions or consortia. A second round of funding in 2000 resulted in a further 50 awards totalling £22 million. The second round covered many of the institutions that were unsuccessful in the first round, but also included 11 collaborative projects.

Further developments have followed in 2001 with the DTI/DfEE White Paper, 'Opportunity for All in a World of Change'. This launched a new initiative to establish University Innovation Centres – large, regionally-based, research and innovation centres often focused on collaboration between HEIs. The University of Newcastle upon Tyne is leading a nanotechnology centre with the other North-East universities for example, but also involving BAE Systems and Procter & Gamble. In parallel, a number of New Technology Institutes are being established to support advanced skills development in the regions.

As part of the shift towards a more permanent structure for third strand funding, HEROBC has now been subsumed into a new HEFCE programme, the Higher Education Innovation Fund (HEIF), which is being launched alongside final calls under the SEC and UC programmes. Subsequently it is intended that HEIF will be the main vehicle for core funding for business interaction, incorporating University Innovation Centre projects.

The situation in Scotland and Wales under devolution and with their own funding councils is somewhat different. Although eligible under SEC and UC as UK-wide initiatives, Scotland and Wales have had their own programmes to encourage HE-business interaction.

In Wales HEFCW has made funds available since 1995/96 to encourage and support training and consultancy services (TACS) provided by Welsh HEIs to industry, commerce, the professions and the public sector. Since 1998 funding has been allocated pro-rata to the average income received in the form of non-research TACS income over the previous two years, and release of funds to HEIs is subject to the receipt of a satisfactory business plan. Since 2000/01 Welsh HEIs have also been required to submit a business plan prior to the release of formula-based funding for their contract research (CR) activities. However from 2002/03 onwards HEFCW will be merging TACS and CR allocations into a permanent stream of funding, together with some graduate employability initiatives, to support institutions' overall knowledge transfer activities. The new fund will be known as the Higher Education Economic Development (HEED) Fund and the Council intends to develop this over time into a substantial third strand of core funding.

HEFCW also has a history of collaborative activity with the Welsh Development Agency (WDA) and the National Assembly for Wales in support of economic development. Jointly funded programmes include the Wales Spinout Programme, Know-How Wales, Graduate Wales, and the Centres of Excellence for Teaching and Industrial Collaboration Programme. With its sister funding body for further education, the National Council for Education and Training for Wales, HEFCW is also promoting a Knowledge Exploitation Fund. This is worth £34 million of Welsh Assembly support over four years starting in 2000/01 (with the potential to exceed £60 million with the support of the European Social Fund).

Scotland has been providing support for commercialisation activities and helping to meet the research needs of the Scottish economy over a number of years. An example of the perceived importance of commercialisation can be seen in an enquiry into the commercialisation of public sector science and technology by Scottish Enterprise and the Royal Society in Edinburgh (SE/RSE, 1996). In order to meet Scottish Enterprise's objectives of increasing employment, prosperity, competitiveness and economic growth, attention was focused on commercialisation in support of existing firms, and through the establishment of new spin-off firms. The enquiry suggested that by increasing the creation of spin-offs from a rate of 60 over the previous 10 years to 150 in the following 10 years, an additional 3,500 to 4,500 jobs could be generated. The primary mechanism for this was to be through a range of proactive support policies, but also through more structural changes within the university system.

What emerged from this review was the Technology Ventures Initiative within Scottish Enterprise, and later CONNECT, a scheme to network together venture finance and other business support agencies to encourage the formation of new technology-based firms, especially from within the universities. SHEFC has contributed to both the Technology Ventures Initiative and CONNECT, but has also directly funded commercialisation activities in the universities through a number of other programmes.

In 1997/98 SHEFC introduced the Research Development Grant in response to the national Foresight Programme to provide a submission-based grant scheme to build research infrastructures for new areas of research relevant to Scotland's long-term economic needs. In parallel, SHEFC developed a Professionalisation of Commercialisation grant scheme to help improve the management of research commercialisation. This has subsequently been merged with the Council's fund for Continual Professional Development to form the Knowledge Transfer Grant. In view of the high priority placed on this by the Scottish Executive in its report on the knowledge economy in February 2001, the grant is being introduced earlier than planned, with additional funds giving £6 million for allocation in 2001/02. This new grant is formula-based and a permanent stream of funding.

In addition to these initiatives by the HE funding bodies, HEIs are increasingly involved in regionally-based initiatives which assist the development of commercialisation and business interaction activities. These include the European Structural Funds distributed through regional partnerships, urban regeneration activities under the Single Regeneration Budget and equivalents in the devolved nations, schemes from the former Training and Enterprise Councils (now under the Small Business Service) and local authority initiatives.

The European Regional Development Fund is worth special mention as the European Commission has been keen to encourage regional partnerships to include elements in their programmes for technology transfer, new technology-based firms, and technical advice to small and medium enterprises (SMEs) – whether on innovation, IT or sustainability. Within such programmes, HEIs have been key delivery agents and have been active participants in the design and management of the programmes. Many of these programmes involve the delivery of free advice to firms, and are therefore not always captured by conventional performance indicators which focus on the financial inputs to the HEI. More detail is provided in section 9 of this report.

The policy framework of HE-business interaction in the UK is thus more supportive than at any time in the past and has been particularly strengthened since 1999/2000. The report that follows focuses on the situation up until that point, providing a baseline figure for the UK's HEIs before the introduction of significant additional funding, but with the benefit of a broadly supportive environment during the 1990s.

3 Institutional strategies

The nature of the interaction between HEIs and business is substantially shaped by the nature of institutional strategies and priorities. Clearly these strategies are themselves a consequence of historical developments and the accumulation of specific resources and assets. Hence different types of institution tend to develop strategies for business engagement that build on their strengths and fit with broader institutional missions. In this sense there is no one model for business interaction: research-based universities will develop a different approach from a university focused more on the lifelong learning needs of its immediate locality.

This plurality has been recognised in the approach to support for business interaction within the funding bodies. Recent programmes of funding have provided support for a range of mechanisms, and in the case of HEROBC for the development of specific institutional strategies that meet the needs of an individual HEI and its particular business partners or regional context.

3.1 Contributions to economic development

In order to examine this diversity of priority and approach, HEIs were asked a number of questions about their overall institutional strategy and approach to business interaction. A number of different forms of contribution were identified and listed for HEIs to select from, covering aspects of the teaching and research missions relevant to economic development, but also including issues such as community development, partnership building and strategic analysis of the local economy. Institutions were able to indicate all those that they felt were appropriate to them, and those elements that were the top three in their case.

The majority of HEIs indicated that most of the forms of contribution were relevant to them in terms of their contribution to economic development, with only one category scoring below 50%. The highest priority was placed on access to education, followed rather surprisingly by supporting SMEs, and developing local partnerships. The lowest scores were for strategic analysis of the regional economy, attracting inward investment, community development and local graduate retention.

However the pattern of response is slightly different for the 'top three' contributions for each HEI. Access to education is again the highest scoring, although this time only 51% of HEIs included it. The next highest were research collaboration with industry, and technology transfer. Support for SMEs falls back to sixth in ranking, perhaps indicating that it is widely recognised to be a priority of public policy and hence a good thing to be doing, but that it is not necessarily a high priority for the majority of HEIs. It is a necessary element in the menu but in practice perhaps presents problems for implementation.

Table 3.1 Areas in which the HEI is seen as making a contribution to economic development (percentages of survey respondents)

	Appropriate contribution (%)	Rank	Top three greatest contribution (%)	Rank
Access to education	91.5	1	51.4	1
Graduate retention in local region	70.9	10	15.2	8
Technology transfer	80.1	7	42.8	3
Supporting SMEs	90.1	2	24.6	6
Attracting inward investment to region	61.0	12	7.2	12
Research collaboration with industry	81.6	5	44.2	2
Strategic analysis of regional economy	44.0	13	0.7	13
Attracting non-local students to the region	79.4	8	12.3	9
Support for community development	69.5	11	9.4	11
Developing local partnerships	85.8	3	21.7	7
Management development	73.0	9	11.6	10
Meeting regional skills needs	82.3	4	26.8	5
Meeting national skills needs	81.6	5	29.7	4
No. of cases	141		138	

Source: HEBI survey 2001

It is clear however that different types of institution tend to see their contribution to economic development in different ways. HE colleges, for example, score much higher than universities on meeting regional skills needs, developing local partnerships and supporting community development. Post-1992 universities tend to focus on access to education, the retention of graduates in the region, meeting regional skills needs and supporting SMEs. This is evidence of a more strategic orientation to the region. Pre-1992 universities, by contrast, emphasised meeting national skills needs more than regional skills needs, and as might be expected are more focused on research collaboration with industry and technology transfer.

Interestingly, older universities also emphasised attracting inward investment more, which perhaps reflects on the perceived value of the research base for multinational firms.

Table 3.2 Areas in which the HEI is seen as making the three greatest contributions to economic development (percentages of survey respondents)

	Pre-1992 university	Post-1992 university	HE college
Access to education	29.5	82.9	57.1
Graduate retention in local region	11.5	22.9	14.3
Technology transfer	60.7	45.7	14.3
Supporting SMEs	8.2	40.0	35.7
Attracting inward investment to region	13.1	0.0	4.8
Research collaboration with industry	73.8	17.1	23.8
Strategic analysis of regional economy	1.6	0.0	0.0
Attracting non-local students to the region	13.1	8.6	14.3
Support for community development	1.6	2.9	26.2
Developing local partnerships	19.7	20.0	26.2
Management development	11.5	5.7	16.7
Meeting regional skills needs	11.5	37.1	40.5
Meeting national skills needs	39.3	17.1	26.2
No. of cases	61	35	42

Source: HEBI survey 2001

On a regional basis the variations were not particularly significant, except that in the 'greater South-East' grouping there was a lower rating overall for graduate retention and technology transfer, and a higher rating overall for meeting national skills needs. The dynamism of the London and South-East economy seems to play a role here, in that HEIs are under little pressure to try to retain graduates within the region as it is a massive importer of graduates from other regions. These other dimensions relate to strong regional policy, and are hence less likely in the South-East, plus this region has a higher proportion of respondents from HE colleges.

3.2 Regional economic development

The economic development of the local region is of continuing importance to HEIs. Almost 60% said that it was a high priority within their institutional mission, and only 7% said it was a low priority. This compares with previous CURDS surveys in 1993 and 1997, which used the same question (although on previous occasions restricted to universities only). In 1997 the figures for universities were very similar to the current survey, with older universities tending to score a little lower and new universities a little higher, but the difference between the two surveys was not really significant.

Economic development tends to be a higher priority for post-1992 universities: over 86% rated it so, compared with just over 50% of older universities and 44% of HE colleges. None of the post-1992 universities rated economic development as a low priority. Even within the older universities there was only one broadly based institution that gave a low priority to the economic development of their region, and all the others indicating a low prioritisation were specialist institutions.

Table 3.3 Importance of economic development of the region in the institutional mission (universities only, percentages)

	1997 survey	2001 survey
High priority	61.5	64.9
Medium priority	33.7	30.1
Low priority	4.8	4.2

Source: CURDS survey for DfEE 1997, HEBI survey 2001

Table 3.4 Importance of economic development of the region in the institutional mission (percentages of survey respondents)

	Pre-1992 university	Post-1992 university	HE college	Total
High priority	50.9	86.5	44.2	58.4
Medium priority	42.1	13.5	44.2	35.0
Low priority	7.0	0	11.6	6.6
No. of cases	57	37	43	137

Source: HEBI survey 2001

Regionally also there was some variation, with HEIs in the South-East grouping being more inclined to rate economic development as a low priority (9.8%, all specialist institutions from London) or a medium priority (47.1%). In the other three regional groupings over 60% of HEIs regarded economic development as a high priority. Again this accords with the results for 1997.

The nature of the local region here is not unproblematic, however. Only 42.8% of HEIs identified most strongly with the RDA area or devolved 'nation' as the greatest priority in the mission. A further 39.1% chose an area defined by the university, either at a sub-regional level or cutting across regional boundaries. What is perhaps more interesting is the differences here between groups of regions. Taking the four main groupings of regions, there is considerable commonality within these groupings but distinction between them. HEIs in London and the South-East do not strongly identify with government-defined regions, but tend to work at the level of the immediate locality or some other area defined by the HEI, usually consisting of a group of counties around the HEI. In the Midlands and South-West there are some HEIs that identify most strongly with the region (although not in the East Midlands), but a slightly higher number tend to focus on their own defined area. Finally, in the northern English regions and in the devolved territories the strongest identification is with the regional or devolved national identity, with a few identifying most strongly with their own defined area.

These characterisations of HEIs as addressing particular 'regions' must however be seen within the wider context. HEIs are complex institutions with a variety of spatial orientations. Regional interactions are only one element within a broader pattern of national and international activities and partnerships, a pattern which will vary considerably from one institution to another. There is no intention here to imply that the regional focus of institutions should be predominant in their strategy, but simply to identify the extent to which HEIs currently identify strongly with particular sub-national territories such as RDA areas, local authorities or some other areas. Even though at the institutional level there may be a strong identification with a particular region, this may not be common across all the activities of the HEI. As we previously noted (Goddard et al, 1994) regional interactions are necessarily multi-scale, and for different purposes and different activities HEIs tend to use alternative regional definitions, depending on the specific partner, on the presence of competing HEIs, and on the natural service territory or market for a particular activity.

Table 3.5 Regional or local unit considered of greatest priority in the institutional mission (percentages)

	L/SE/E	WM/EM/SW	NE/NW/YH	S/W/NI	All
Regional/local area not of any significance to mission	9.8	3.3			4.3
Government region/RDA area	21.6	43.3	60.7	62.1	42.8
County	3.9	3.3	10.7	3.4	5.1
Locality – city, town or rural district	17.6		3.6	6.9	8.7
Area defined by the HEI (e.g. surrounding counties)	47.1	50.0	25.0	27.6	39.1
No. of cases	51	30	28	29	138

Source: HEBI survey 2001. Regions: London (L), South-East (SE), East; West Midlands (WM), East Midlands (EM), South-West (SW); North-East (NE), North-West (NW), Yorkshire and Humber (YH); Scotland (S), Wales (W), Northern Ireland (NI)

3.3 Focus on particular sectors

Many HEIs are focusing on particular sectors in their business interaction. Such a focus might build from particular research strengths or the overall orientation of an institution towards particular disciplines and hence industries. Institutions seeking to build a focus for their interaction with business often target particular sectors or clusters as a means of directing and differentiating their efforts. In some cases the orientation will be obvious – a college of agriculture or a medical school – whilst in others a general purpose university might decide to focus on a local industrial strength, such as automotive engineering in the West Midlands or oil and gas extraction in Aberdeen.

Almost all HEIs indicated some form of sector focus, although the nature of the response indicated that some were able to make a more considered response than others. Several forms of response could be identified. Many of the sectors suggested were fairly predictable knowledge-based sectors or clusters. A total of 48 HEIs identified biotechnology, life sciences or pharmaceuticals as one of their three most important sectors, and 52 HEIs identified various permutations of information and communication technologies, digital technologies, new media or telecommunications. Cultural and creative industries were popular, with 35 mentions, and various engineering sectors were also frequently mentioned (electronics 16 times, aerospace and automotive 15 times each, and more general engineering 17 times). Agriculture, land-based industries and the food chain were mentioned by 19 HEIs, and healthcare was identified by 20.

Another group of respondents focused on very specific sectors that were highly local: oil and gas for both of the Aberdeen universities, motor sport for Oxford Brookes, and automotive for Coventry and Warwick for example.

A third form of response was a rather unspecific or vague mention of 'manufacturing', 'business and professional services', 'business' or even 'SMEs'. Clearly for these HEIs there is no sharp focus for their activities, although for some this was a catch-all term following a more specific primary focus. It does raise some concerns though that some institutions have not thought through whether or not their business interaction ought to be focused. In the case of institutions simply identifying 'SMEs', there is no unifying form of demand as SME characteristics and demands are almost infinitely variable, and this reveals a naivety. The institutions mentioning this were all HE colleges; in general most of the responses where an inappropriate term was used came from colleges. Other responses in this group included 'corporate', 'companies', 'management in SMEs', and 'business in the community'. One institution referred to 'enabling technologies', which seemed to refer back to their own activities rather than the sectors on which they focused.

A fourth response was to identify a focus within the public sector or community, even though the questionnaire asked for business sectors or clusters. Such an orientation may be entirely appropriate – not all HEIs need to be focused exclusively on interaction with business – but this specific study looked only at the business sector. HEIs identified 'education', 'local government', 'international agencies', 'applied social science', 'VSO and not for profit', and 'community development'. As already noted, healthcare was frequently mentioned. Again many of these institutions were more specialised and frequently were HE colleges, and as such may be primarily focused on public sector activities. This fits with other comments from institutions that the questions were too focused on private sector activities when much of their interaction was, for example, with the NHS.

The questionnaire also asked for the reasons behind the choices of sector focus. This was largely driven by the existing strengths of the HEI and demand from the companies themselves. External factors such as RDA strategies or perceived market gaps were much less important. Thus HEIs are making their choices on a highly rational if internally-driven basis.

Table 3.6 How HEIs' priority sectors were selected (percentage of different types of institution)

	Pre-1992 university	Post-1992 university	HE college	Total
The HEI is a specialist institution focused on sector-specific areas	30.0	21.6	76.2	41.7
The HEI took its cue from priorities in RDA regional strategies	35.0	48.6	31.0	37.4
Response to demand from companies in these sectors	68.3	75.7	59.5	67.6
The HEI identified important business clusters in its region	48.3	75.7	38.1	52.5
These sectors had best fit with the institution's expertise	91.7	91.9	66.7	84.2
The HEI focused on a 'gap in the market' left by other HEIs	3.3	27.0	21.4	15.1
Other	6.7	10.8	4.8	7.2
No. of cases	60	37	42	139

Source: HEBI survey 2001

It is evident from Table 3.6 that all universities were driven by institutional factors, though post-1992 universities were slightly more likely to follow RDA priorities and to identify important clusters in their region. The HE colleges were more likely to consider themselves to be specialist institutions focused on sector-specific areas.

The selection of sectors or clusters varied also by region to some degree. One particular institutional variation between regions was the effect of RDAs. These seemed to be considerably more influential in the North and Midlands, presumably because of their role in new regional cluster policies backed up by the promise of resources such as the European Regional Development Fund (ERDF). In the northern English regions a slightly higher proportion of institutions identified demand from particular companies as driving their strategy, and the selection of sectors that fit with the institution's expertise, but overall there seemed to be a stronger response to sector needs across these regions.

Some regional differences are also affected by the nature of institutions: a higher proportion of HEIs in the South consider themselves to be specialist institutions and therefore have a more focused orientation.

Table 3.7 How HEIs' priority sectors were selected (percentage of HEIs in each region)

	NE/NW/YH	WM/EM/SW	L/SE/E	S/W/NI
The HEI is a specialist institution focused on sector specific areas	35.7	43.3	50.0	31.0
The HEI took its cue from priorities in RDA regional strategies	53.6	56.7	25.0	24.1
Response to demand from companies in these sectors	75.0	63.3	69.2	62.1
The HEI identified important business clusters in its region	53.6	53.3	53.8	48.3
These sectors had best fit with the institution's expertise	92.9	86.7	78.8	82.8
The HEI focused on a 'gap in the market' left by other HEIs	14.3	13.3	13.5	20.7
Other	7.1	13.3	3.8	6.9
No. of cases	28	30	52	29

Source: HEBI survey 2001. Regions: North-East (NE), North-West (NW), Yorkshire and Humber (YH); West Midlands (WM), East Midlands (EM), South-West (SW); London (L), South-East (SE), East (E); Scotland (S), Wales (W), Northern Ireland (NI)

3.4 Benchmarking institutional strategies

HEIs were asked to grade their institution using three benchmarking questions: on their strategic plan for business support, the level of incentives for their staff to engage with industry, and their involvement with regional skills strategies. These benchmarking questions were initially developed as part of a separate project for the HEFCE on the regional contribution of higher education, with the intention that they could be used within institutions for self-assessment and as part of internal strategy reviews.

The questions were intended to be applied within an institutional benchmarking process, whereby a range of staff came to a consensus position on the response, and where some external validation would also be possible based on discussions with partner organisations. In the questionnaire, responses were mainly made by individuals or following discussion among a senior management team. It is therefore our expectation, judging by some of the individual responses, that there has been a varied degree of objectivity in the response to these questions, with some institutions perhaps being a little aspirational in their replies. The responses should therefore be seen as the perceptions of the institutions as to their practices rather than an objective measure. The true value of such benchmarking questions lies more with the process of reaching an internal consensus and on there being an external challenge to the organisation's internal perceptions.

In each of these questions, responses were required on a scale from 1 to 5, with 5 representing good practice. Specific descriptions were provided at points 1, 3 and 5, so responses will be largely discussed according to the numerical values rather than the more extensive descriptions provided.

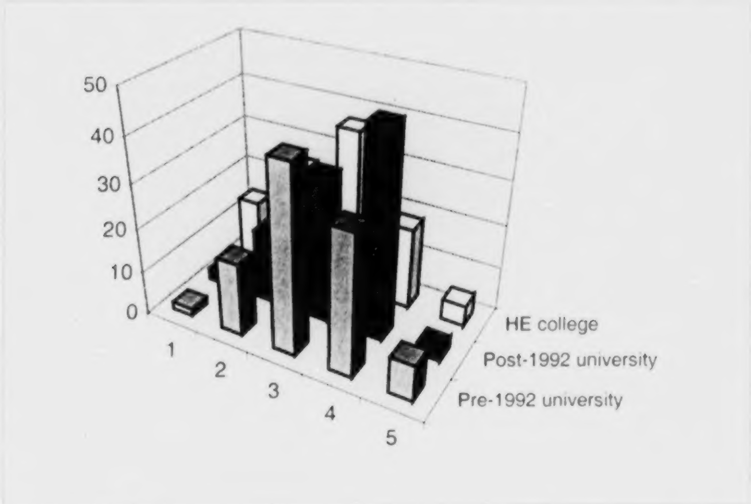
3.4.1 Strategic plan for business support

The first of the benchmarking questions asked HEIs about the extent to which they had in place and had fully implemented a strategic plan for business support. The benchmarking grades below offered a possible scale: from 1 where the institution had no strategic plan at all and was engaging in a very ad hoc manner, to 5 where it had a well developed plan that was fully implemented and embedded in the culture of the institution.

1	2	3	4	5
No strategic plan in place. Ad hoc approach to business support.		Strategic plan developed and only partially implemented, or restricted to certain departments or central functions.		Strategic plan developed as a result of an inclusive process across the whole HEI. Accepted across almost all units and recommendations implemented. Use of plan to set targets and monitor achievement.

The results are presented in Figure 3.1 for the three main types of institution, showing the percentage of each at the five reported levels. The majority of institutions peak around the modal value of 3, rising to 4 for the post-1992 institutions: 45.9% of post-1992 universities chose level 4 compared with 31.7% of pre-1992 universities and only 18.6% of HE colleges. For HE colleges this is understandable given the presence of small specialised arts colleges and the like.

Figure 3.1 Existence and implementation of strategic plan for business support (percentages of each grouping)



Source: HEBI survey 2001

When the sample is analysed by region there are no substantial differences between the English regions. However in the devolved territories there was a more bifurcated distribution, with the majority scoring 4 (40%), followed by category 2 (30%), and with category 3 lagging behind (20%).

3.4.2 Involvement in regional skills strategies

The second benchmarking question focused on the extent to which the HEIs contributed to the development and implementation of regional skills strategies. Here the benchmark prompted consideration of both the role of HE senior staff in regional partnerships and the extent to which the institution brought other resources to bear, such as a capability to apply its expertise and access to data. Again the questions and scale used are replicated below.

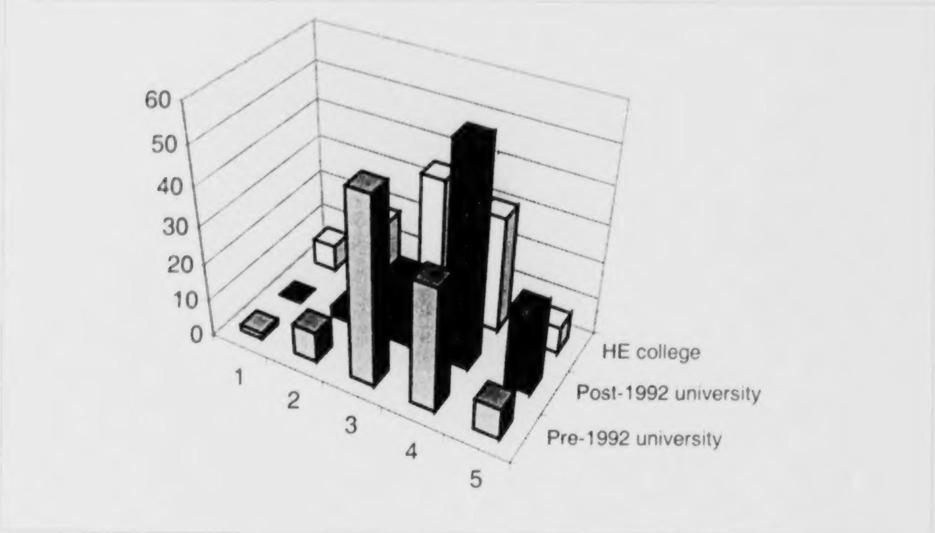
1	2	3	4	5
Passive response to skills strategies. No involvement in steering committees, no provision of data or expertise. No attempt to influence or respond to strategy during consultation.		Some engagement with regional partners and provision of expertise and data, but approached as a narrow sector-specific interest. Involvement from officers with defined role rather than leadership inputs.		Pro-active engagement providing expertise data, interpretation and leadership inputs. HEI seen as a core asset in the region and becomes a central element within the strategy.

Here we see a slightly higher set of scores than in the previous question, with almost equivalence between levels 3 and 4 in the total group (37.1% at 3 and 38.6% at 4).

There is also a relatively large group of institutions scoring themselves at 5, notably among the post-1992 universities. The lower priority placed on contributing to regional skills needs by pre-1992 universities highlighted in an earlier question is reinforced here. This group perceive that their engagement in this area is more from a narrow sector-specific interest involving officers, rather than a strategic and proactive approach expected for best practice institutions. It is evident that the post-1992 universities have sought to position themselves more pro-actively as core partners in regional skills networks.

Again there are some small differences between regional groupings, with a majority of HEIs in the Midlands and South-West grouping clearly opting for level 4, whilst only slightly more institutions in the North-West, North-East, and Yorkshire and Humber category also opt for category 4. The South-East category is focused at level 3. In the devolved territories there is a clear indication that HEIs in Wales and Northern Ireland score themselves higher than those in Scotland.

Figure 3.2 Involvement in the development and implementation of regional skills strategies (percentages of each grouping)



Source: HEBI survey 2001

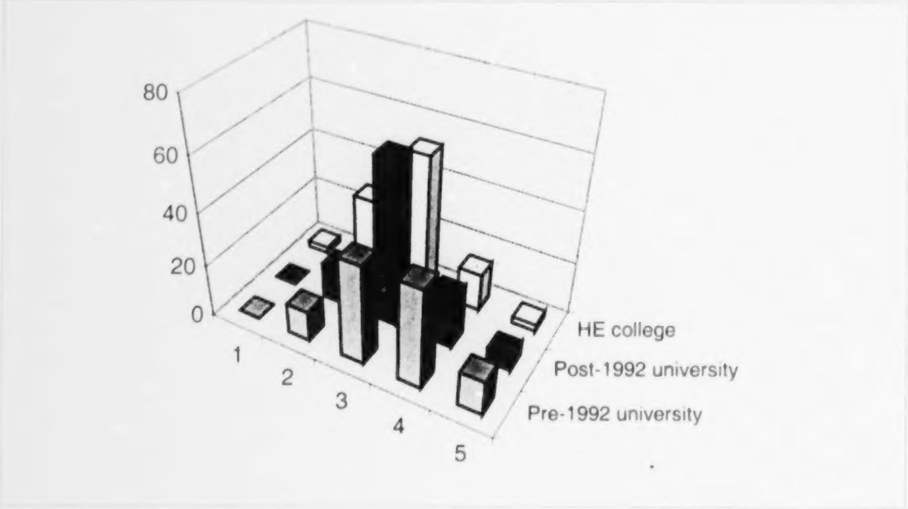
3.4.3 Incentives for staff to engage with business

The third of the benchmarking questions looked at the levels and types of incentives available within the institution to encourage staff to become engaged with business. The focus here was on the existence of clear incentives, which might be financial or related to career progression, and that these incentives were strongly signalled to all staff and well understood. It has been long recognised that the incentives for business engagement are often mixed at best. Many promotion procedures fail to adequately recognise and reward collaboration with business, as opposed to producing traditional academic publications or winning research council grant awards.

1	2	3	4	5
Barriers outweigh any incentives offered. General corporate culture is focused on internal activities and narrow interpretation of teaching and research. Collaboration with industry seen by staff as detrimental to career progression.		Some incentives in place, but with some barriers remaining. Typically policy may be generally supportive but there is a lack of understanding across the institution. Promotions committees still take a narrow focus on research even though guidance suggests industrial collaboration is valued equally.		Strong positive signals given to all staff to encourage appropriate levels of industrial collaboration. Incentive procedures well established and clearly understood and applied.

Unlike the previous two benchmarks, this question saw a more positive response from the pre-1992 universities with equal scores for level 3 and 4, whilst the post-1992 universities were strongly clustered at level 3, as were the HE colleges though to a slightly lesser extent. This result may suggest that the older universities, with greater potential for financial incentives through patent exploitation, and with greater conflicts between the need to achieve research excellence and address business needs, have needed to place more emphasis on recognising and rewarding business collaboration.

Figure 3.3 Incentives for staff to engage with business (percentages of each grouping)



Source: HEBI survey 2001

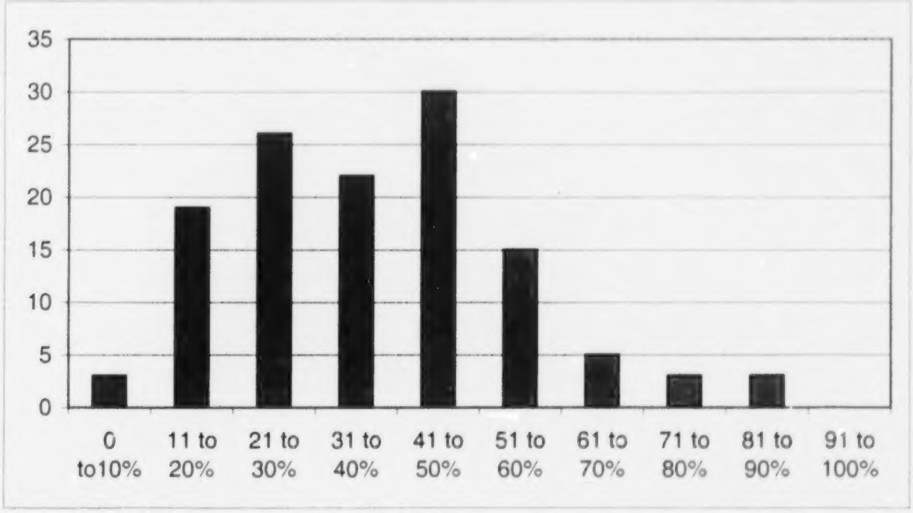
The regional profile of this question is different again from before. Within the English regions the Midlands grouping, the south-eastern grouping and the north of England grouping are all concentrated on level 3, although to a lesser extent in the north of England. By contrast in the devolved territories the sample is mainly split evenly between levels 3 and 4 (40% each), which perhaps indicates the effects of considerable public policy encouragement for rewarding this kind of activity. The Scottish policy on technology exploitation and its recognition of the need for institutional cultural change and incentives may have been influential here.

3.5 Business representation on HEI governing bodies

The strategies and orientation of HE to business, and to other stakeholder interests, can be affected by the governing bodies of the institutions. For this purpose HEIs seek to involve stakeholder representatives on governing bodies to advise and assist in meeting stakeholder needs.

Most HEIs have half the membership of their governing bodies drawn from the business sector. The nature of governing bodies varies between institutions, and notably between the pre- and post-1992 universities. The incorporation of the former polytechnics typically led to smaller boards with greater legal responsibility, whilst pre-1992 universities tended to have much larger councils representing a wide range of local interests. These distinctions are noticeable in the proportion of business representatives: 47% of post-1992 universities have more than 50% representation compared with only 3.7% of pre-1992 universities; and 45% of pre-1992 universities had less than 25% representation. The HE colleges were more evenly balanced: a third had 40-50% of business representation on their governing bodies. From a regional perspective, the institutions in the more peripheral regions were less likely to have high levels of business representation, with most of those with over 50% representation (18 from 26) coming from the Midlands and the South.

Figure 3.4 Percentage business representation on the HEIs' governing bodies



Source: HEBI survey 2001

3.6 Support for interaction with business

The level of support for these activities within the HEI can be judged by the number of staff involved in the commercialisation and industrial liaison function.

Inevitably the HE colleges had quite small commercialisation teams, as most of them are small institutions with limited research activities. What is perhaps more surprising is that some of the pre-1992 universities also have small commercialisation units, and in some cases employ no staff at all in this function. Whilst some of these are specialist institutions, there are a number of mainstream universities, especially among the pre-1992 sector, that employ only one or two staff in this function. This contrasts with those employing more than 20, and in some cases 40, 50 and 60 staff. Some of the universities employing many staff are no larger than institutions employing one or two.

This raises the question of whether institutions with large numbers of commercialisation staff achieve higher outputs. However, there does not seem to be a clear relationship as many of the staff in central liaison functions are supporting diverse missions. Assessment would need to be made across a broad range of outputs, some of which are not included here. Indeed it would seem dangerous to make assumptions about effectiveness based on any set of indicators, given doubts about the inclusivity of indicators and the negative consequences of audit-induced strategies.

Across the sample as a whole, 135 institutions identified a total of 1,217 staff involved in commercialisation activities.

Table 3.8 Number of staff involved in commercialisation and industrial liaison offices (percentages)

No. of staff	Pre-1992 university	Post-1992 university	HE college	Total
0	5.2	0	19.5	8.1
< 2.5	22.4	2.8	48.8	25.2
2.51 to 5	19.0	36.1	22.0	24.4
5.01 to 10	13.8	25.0	4.9	14.1
10.01 to 20	22.4	22.2	2.4	16.3
> 20	17.2	13.9	2.4	11.9
No. of cases	58	36	41	135

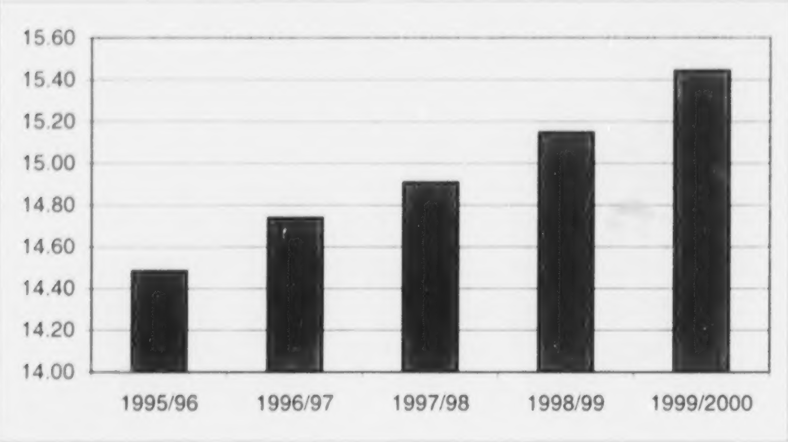
Source: HEBI survey 2001

4 Collaborative research with business

4.1 Research income

The undertaking of externally funded research is one of the core activities of HEIs, and one that has been growing over the past 20 years or so. Just during the latter half of the 1990s, in a period when grants from the UK HE funding bodies were increasing in absolute terms, research grants and contracts continued to grow at a more rapid rate than overall HEI income. From a total of £1.5 billion in 1995/96 and 14.48% of total income, research grants and contracts have increased to almost £2 billion in 1999/2000 and 15.44% of total income (Figure 4.1), a growth rate of 7.7% on the previous year.

Figure 4.1 Growth in research grants and contracts as a percentage of total HEI income



Source: HESA statistics

This income can be viewed in two main dimensions. Conventionally, research income is disaggregated by funding source: UK public sector, industry, overseas, and so on. This allows us to identify that proportion which derives from industrial sources as opposed to government, although overseas industrial income tends to be merged in with projects funded by overseas governments and other bodies.

Another dimension is to consider the distinction between research grants and research contracts. A research grant is typically awarded by government or charitable funding bodies, following a proposal drawn up by an academic researcher within a standard funding framework. Usually the topic of the research is selected by the researcher and the terms and overhead rates are fixed. Research contracts in comparison are usually projects that are in response to a specification by the funding body, often through a process of tendering, and where the terms and overhead rates are negotiated on a project by project basis. This applies to most industrial projects, but also to some public sector projects. In the sections that follow we will draw on both of these forms of segmenting research income in looking both at research income from business and at the involvement of business in public sector research grants.

Table 4.1 Research grant and contract income of UK HEIs by year and source (£millions)

	UK industry	OST/ Research Councils	UK based charity	UK government	EU	Other overseas	Other source	Total
1995/ 1996	169	532	338	269	148	59	38	1554
%	10.9	34.2	21.8	17.3	9.5	3.8	2.4	100
1999/ 2000	242	604	485	337	167	98	40	1973
%	12.3	30.6	24.6	17.1	8.5	5.0	2.0	100

Source: HESA statistics

The majority of research grant and contract income derives from public sector budgets, and the proportional split for those sources varies little from year to year. The main change in recent years has been a slight increase in the proportion that comes from industrial sources, up from 10.9% in the mid 1990s to 12.3% last year, and a growth in charitable income from 21.8% to 24.6%. Research council and government income has seen relative decline although absolute growth.

It is difficult to make direct comparisons with universities from other countries due to differences in the level of public sector support for university research, and differences in policies on overheads and so on. The Association of University Technology Managers (AUTM) in North America undertakes an annual survey of US and Canadian universities which provides data on research expenditures from industrial sources and total sponsored research expenditures. For 139 US universities, heavily weighted towards the most research active, industrial sources accounted for 9.4% of sponsored research expenditures; for 20 Canadian institutions the proportion was 17.4% (AUTM, 2000). Given the various caveats above, and the more selective nature of the North American survey, the UK position is not dissimilar to that in North America.

4.2 Contract research income from business

In the questionnaire HEIs were asked to provide more detail on the sources of income for the contract research elements of these figures. By contract research we mean research projects that have been requested by the client, as distinct from schemes where the HEI applies to undertake research projects that they have initiated. HEIs were also asked for a breakdown of these figures by regional, UK and non-UK geographic areas.

The response to this question was relatively poor, with a majority of HEIs being unable to provide detailed figures. There was also some ambiguity between the regional and UK totals: some reported virtually no regional income when logic would suggest this was unlikely (in London, for example). The limited response meant that reporting on the full dataset was of limited value. However, for the sample for which we had good data, we were able to identify the element of the contract research for business that was within the local region, relative to that which was national or international. Sixty-one HEIs were able to produce figures that allowed us to calculate the percentage of research contracts with industry that were with regionally-based firms. However, in a number of cases it was not clear from the HEIs whether a zero return for the region meant no identifiable contracts in the region or an inability to identify a figure for it. We believe that in a number of cases institutions are regarding nationally-oriented firms within the local region as national rather than regional sources. (For example, a London HEI might regard a contract with a multinational company branch based in London as a national contract, whilst a Scottish HEI with a contract with a Scottish branch of the same company might view it as regional.) This may be especially the case within London and the South-East where the perception of the local region as being distinct from a national identity is most problematic.

Table 4.2 Percentage of research contract income from business that originates from the HEI's region (percentages for each grouping)

	Pre-1992 university	Post-1992 university	HE college	Total
0	17.9	5.6	46.7	21.3
0.01-10	28.6	11.1	0	16.4
10.01-20	14.3	11.1	0	9.8
20.01-30	21.4	16.7	0	14.8
30.01-40	7.1	27.8	6.7	13.1
40.01-50	7.1	11.1	6.7	8.2
50.01-60	0	0	0	0
60.01-70	3.6	0	13.3	4.9
70.01-80	0	5.6	0	1.6
80.01-90	0	0	6.7	1.6
90.01-100	0	11.1	20.0	8.2
No. of cases	28	18	15	61

Source: HEBI survey 2001

It is clear from Table 4.2 that for most universities the percentage of research contract income from local business is relatively small. Discounting institutions that reported no research income from business, only 50 institutions gave usable information on income from the region and in total. For this group as a whole, 19% of £129 million total income was reported to be from within the region of the institution. These responses account for around 56% of total reported contract income from business within the surveyed institutions, or 53% of the research income from industry reported to the Higher Education Statistics Agency (HESA). The proportions varied considerably for the different groups of HEIs: only 17.5% of pre-1992 income from business was reported as being from within the region, compared with 35.9% of post-1992 universities and 75.8% of HE colleges.

4.3 Collaborative research grants

Whilst HEIs currently declare the level of research grant and contract income from UK industry as part of the HESA financial return, this is only a part of the research grant income that involves collaboration with industry. A considerable number of publicly funded research programmes require industrial collaboration, although the precise level of income associated with these has not been monitored in the past.

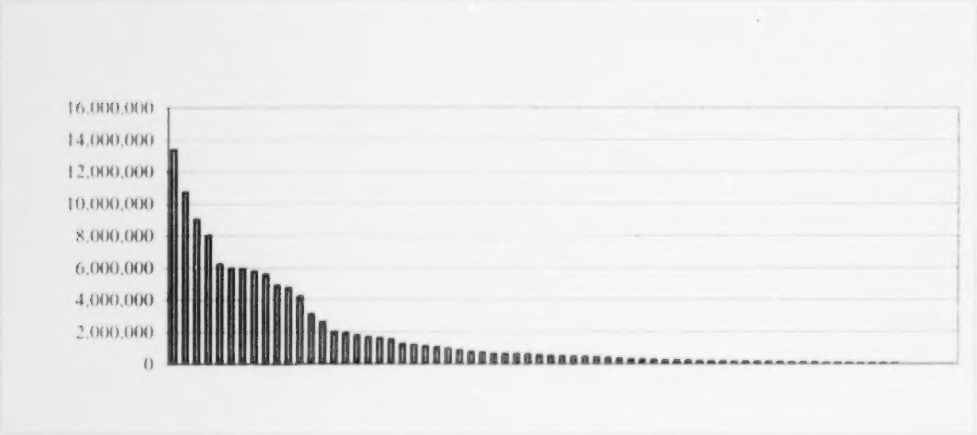
In order to estimate the extent to which public research grants to HEIs involve collaboration with business, the HEIs were asked to identify the income from research councils, other Office of Science and Technology (OST) schemes, the EU Framework Programme and any other public grant schemes where business was involved. In each of these cases HEIs participate in grant applications, where the HEI suggests the research to be carried out rather than responding to a specification drawn up by a sponsor. These sources provide funds that may involve direct industrial collaboration or may be purely academic in nature. In the Framework Programme, for example, most projects involve a combination of academic and industrial partners, with the European Commission providing a subsidy to both, although not the full costs of the research. However, a proportion of Framework Programme projects will involve only academic and public laboratories, and have no business inputs due to the nature of the research task. Hence the value of research grants with business collaboration from these sources will usually be less than the total income from such programmes.

Responses to this question, as with that on regional business income, were quite poor: many HEIs do not have information systems that provide access to the data requested as this information goes beyond existing HESA statistical requirements. Consequently some respondents were unable to provide a figure or were only able to give estimates. Examination of data supplied revealed some significant inaccuracies in comparison with data provided to HESA on research income, and it was not possible to resolve these questions without considerable additional time input from the HEIs concerned.

Figure 4.2 shows the levels of income received by respondent HEIs from research councils, where the projects involved direct collaboration with business. In these cases firms may have provided some additional or matching funds to the HEI, or be a partner in the project. As can be seen in the figure, the distribution is quite peaked, although a number of research-intensive universities were not able to provide data and so it is very much a partial view. Nonetheless the key message is that many HEIs are, in addition to direct research funding from business, undertaking millions of pounds of collaborative research with business funded by research councils.

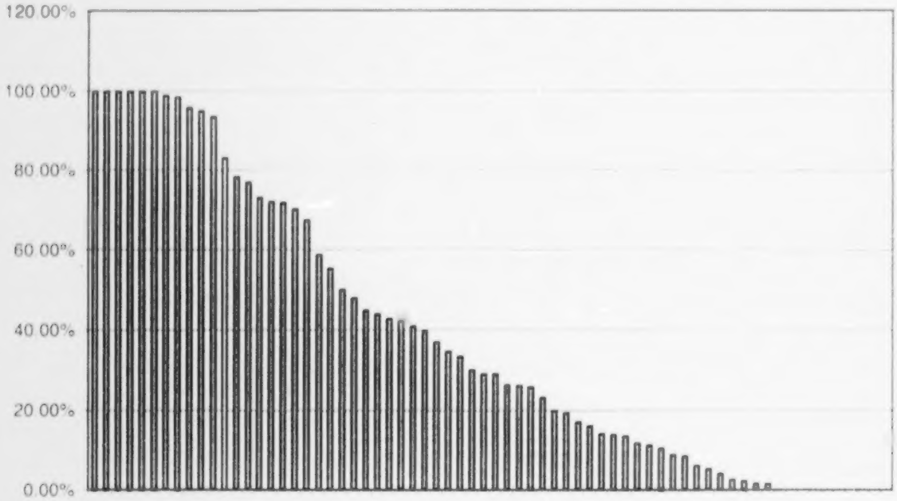
In proportional terms, Figure 4.3 shows the range of percentages for those HEIs which were able to provide usable data on income from OST sources (including research councils) in which there is business collaboration, as compared with total OST income. These can be seen to range from 100% down to zero, although the latter extreme mainly involves institutions with very low OST income, possibly a single project. Taking the mean for the 68 institutions involved, 24.6% of OST projects had business involvement, although for the reasons quoted above this may not be a particularly accurate or representative figure for the sector as a whole.

Figure 4.2 Income from research councils involving business collaboration (absolute values for respondent HEIs)



Source: HEBI survey 2001

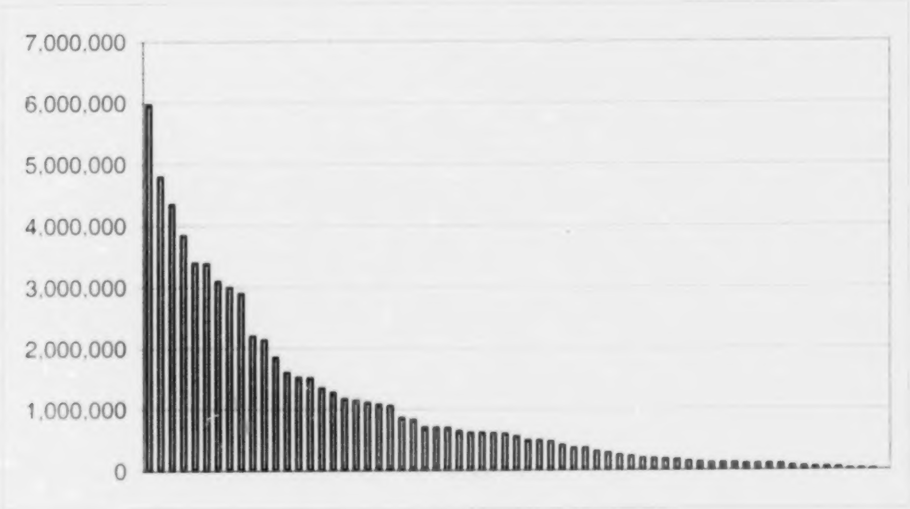
Figure 4.3 Percentage of OST/research council grant income involving collaboration with business (for respondent HEIs)



Source: HEBI survey 2001

Similarly, Figure 4.4 gives the level of income from participation in Framework Programme grants involving collaboration with business. Here, unlike the research council cases, the firms will not usually provide any income to the HEIs but will be subsidised by the European Commission to participate in the projects as a partner.

Figure 4.4 Income from EU Framework Programme involving business collaboration (absolute values for respondent HEIs)



Source: HEBI survey 2001(HEIs with zero income excluded)

4.4 Contracts with SMEs

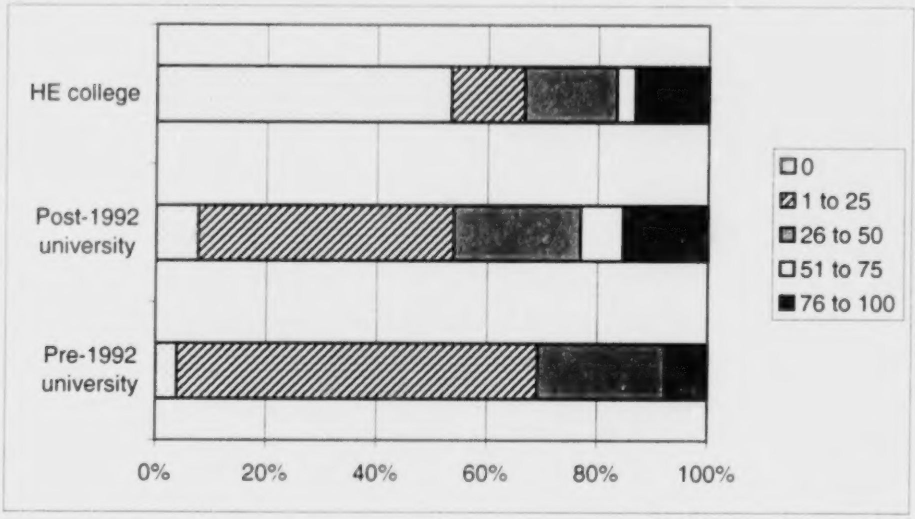
In the previous section we considered the income associated with research contracts with business. Much of this may be with relatively large and technologically sophisticated firms, but increasingly there is encouragement from government, and through other forms of programme, for HEIs to collaborate more with smaller companies. Not least, the growth of small high technology firms in new science-based sectors creates a potential source of collaborative partners that are well tuned to the ways of HEIs and have interests that fit well with HEI capabilities.

However, when asked about the extent to which research with business involves SMEs, there was again a relatively low level of response. In most cases the databases of research contracts used by HEIs are primarily financial accounting systems, and little information is collected and held centrally on the characteristics of the business. Few HEIs are therefore able to monitor the numbers of firms with which they have contracts that are SMEs. The exception would usually be related to the use of restricted funds such as the ERDF, where only SMEs could be assisted with the benefit of public subsidy. This however is not likely to be an issue where the company is paying for the research, as is the case with this question.

A second limitation concerns the means by which HEIs would identify whether or not a company is an SME. In practice the principal investigator on a project might be expected to know a little about the company, or could ask the company for some information on their status. But previous work has shown that the size of the company is not always clear, and many companies fail to meet the criteria through ownership links, which might not be clear to the principal investigator.

Despite these caveats, 69 of the HEIs in the sample were able to provide a number for the proportion of research contracts which were with SMEs. The response rate was higher for the HE colleges, although in most cases the result was zero. For the pre-1992 universities the proportion of SMEs was typically low, under 25%. For the post-1992 universities and HE colleges there was a slightly higher proportion where the majority of contracts were with SMEs: 23.1% of post-1992 universities and 16.6% of HE colleges had over 50% of business contracts with SMEs.

Figure 4.5 Percentage of contracts with SMEs – percentage of HEIs of each type

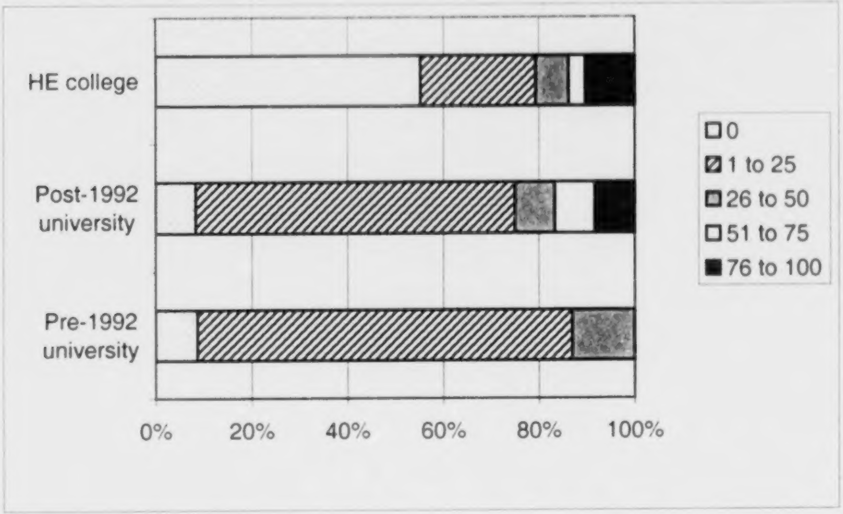


Source: HEBI survey 2001

Taking the results by value, the response rate was even lower, with only 64 responses, and the emphasis was shifted even further to the lower percentages. Again a high proportion said zero – 29.7% of responses – and again the older universities were more concentrated in the under 25% category. Overall though all three groups saw a higher proportion in the 50% and under categories than in the previous question.

For both figures the proportion of institutions reporting zero is likely to be overstated. It is inevitably easier to respond if there are no contracts with SMEs than if there are some. Hence, all of those HEIs which were unable to respond due to inadequate data or excessive time required would be likely to have some SME contracts.

Figure 4.6 Percentage of contracts with SMEs by value – percentage of HEIs of each type



Source: HEBI survey 2001

4.5 Research students and Teaching Companies

Another form of research collaboration involves the use of postgraduate research students on CASE studentships (Co-operative Awards in Science and Engineering), where the cost of the studentship is shared between a research council and a non-academic partner, usually a business. A variant on this is the TCS (formerly the Teaching Company Scheme) where a graduate, usually registered for a higher degree, is employed to work in a company on a research or technology transfer project under continuing supervision from the HEI. These two approaches tend to be well regarded by businesses and are often used by academic staff as a step towards more extensive collaborative research, as the costs for the company are comparatively low, especially for CASE awards. In recent years CASE has been expanded beyond the science and engineering disciplines to encompass social sciences, and a number of CASE awards are now made by the Economic and Social Research Council (ESRC), often for work related to management issues.

CASE awards tended to be particularly concentrated in the old university sector, with none of the post-1992 universities or HE colleges having more than 10 such awards during 1999-2000, and most having none. The highest scoring HEIs have over 100 current CASE awards and are a fairly predictable list of Russell Group and research-intensive universities. The highest reported number for a post-1992 HEI is 8, a number which may be exceeded by a single department in a research-based university (and in some cases even by individual management or social science departments). This broadly reflects the overall distribution of research income.

Table 4.3 Number of CASE awards per HEI 1999/2000

Number of CASE awards	HEIs
0	57
1-10	27
11-25	13
26-50	8
51-75	6
76+	6
All	117

Source: HEBI survey 2001

The total number of awards held by the respondents to the questionnaire was 1,687; 472 were known to be with partners in the same region as the HEI, although not all respondents were able to provide an answer to this. Only 46 HEIs were able to give an answer of one or more, compared with 60 that reported having CASE students.

For TCS, answers were provided by 135 HEIs, of which 87 had at least one TCS programme. Here there was a much more balanced distribution between pre- and post-1992 institutions. There was no significant difference between the two groups in their propensity to access TCS support, and three of the six HEIs with most schemes were post-1992 universities. Very few HE colleges were involved: only five had programmes, three with one each and one with seven programmes. Overall the respondents reported a total of 734 programmes with 824 Teaching Company Associates.

Table 4.4 Number of TCS programmes 1999/2000 (percentage of each group of HEIs)

Number of TCS programmes	Pre-1992 university	Post-1992 university	HE college	Total
0	19.6	2.7	87.8	35.8
1-5	41.1	40.5	9.8	31.3
6-10	10.7	18.9	2.4	10.4
11-15	14.3	18.9	0	11.2
16-20	8.9	10.8	0	6.7
21-30	5.4	8.1	0	4.5
All	56	37	41	134

Source: HEBI survey 2001

Regionally there were no significant differences except that in the South, Scotland and Wales there were a higher number of institutions with no TCS programmes, but these were mainly HE colleges and reflected the fact that there are proportionately fewer HE colleges in the North of England.

The majority of programmes were reported to be with partners based within the same region as the HEI – 550 out of 734 (although for 51 programmes the region could not be identified).

Table 4.5 Number of CASE studentships and TCS projects by region

Region	CASE studentships	TCS projects	TCS associates
North-East	46	33	35
North-West	278	74	81
Yorkshire	148	68	79
East Midlands	64	40	44
West Midlands	198	91	108
East	24	28	40
London	248	77	84
South-East	218	60	61
South-West	199	71	79
Scotland	193	76	83
Wales	42	62	69
Northern Ireland	29	54	61
Total	1,687	734	824

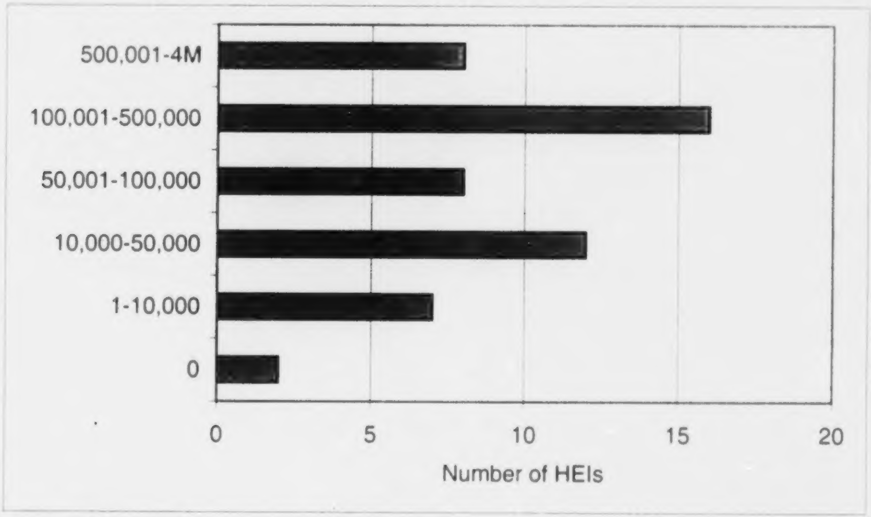
Source: HEBI survey 2001

4.6 Equipment services

Many HEIs provide access to particular forms of equipment for companies, often SMEs: 102 of the respondents indicated that they provided this sort of service, compared with 36 that did not. However, only 53 were able to place a value on this income. Figure 4.7 shows the main categories for these. Whilst there is no clear pattern overall, there seems to be a group of institutions with relatively low levels of income from this activity, typically in the low tens of thousands, often below £20,000. If concentrated in one unit this might pay for the cost of a technician or the support costs of a laboratory, but otherwise it is a very marginal activity where the greatest benefit is to the firms rather than the HEI. We should also recognise here that in some cases funds from other sources such as ERDF might be supporting such services, and provision is made at little or no cost to the firm. The other main group is those HEIs reporting incomes of several hundred thousand and in three cases of one million pounds or more. These are much more significant business activities.

The total value reported by the 53 HEIs able to provide responses was £18,098,771, although 58% of this was accounted for by the five largest amounts and 22% by the single largest. Given the lumpy nature of these figures, it is impossible to estimate what the overall total might be, as a non-respondent might also account for a significant proportion. Indeed as the largest amounts were recorded by members of the Russell Group, but many of this group were unable to provide a figure for this source of income, it is likely that the real aggregate is much higher – perhaps by a factor of three or more. However, there is no robust method for calculating this on the basis of the information provided.

Figure 4.7 HEIs providing equipment-related services classified by income (£) from these activities



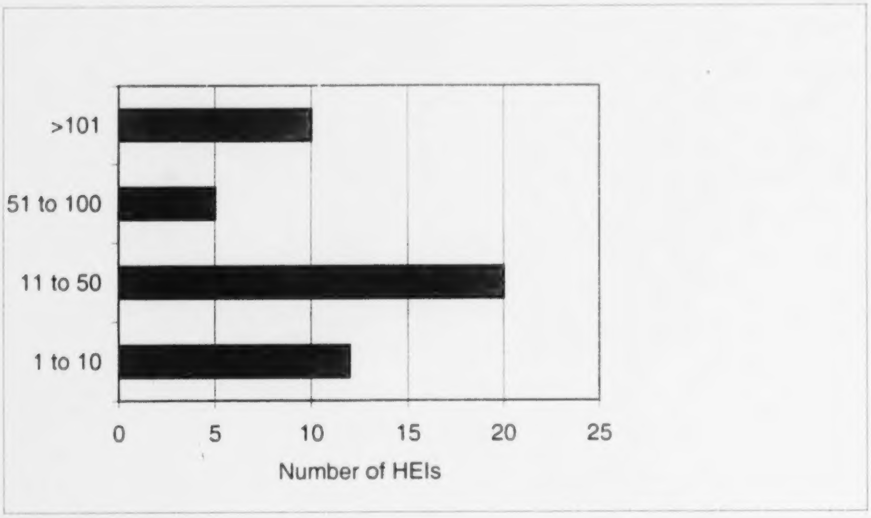
Source: HEBI survey 2001

Analysis of the proportions of this income that originate from regional, national or foreign firms is not particularly fruitful due to the small numbers able to provide such detailed information. Of the 41 HEIs able to provide disaggregated figures, for a total of £11,834,157, 25% was from regional sources and only 12% from foreign sources. These proportions varied hugely among the HEIs, from those with almost 100% of such income from regional sources and others with very low proportions of regional income.

It is clear from this that some institutions provide these sorts of services for a primarily local service base, through a combination of specialist and general facilities, often with public support through programmes such as the European Structural Funds. Others operate specialist facilities at a national scale, usually through departmental initiatives. However the characteristics of HEIs selecting these routes are highly varied, with the focus depending often on individual departments or research groups. For many HEIs, the availability of external funding for acquiring equipment to support research will also require the provision of services to business, such as through ERDF programmes. In these cases the primary orientation will be to the local region and SMEs.

Fewer HEIs (only 47) were able to provide information on the total number of firms making use of these services. Most of these report relatively small numbers of firms, typically under 30, with again a small group with much higher levels of involvement. A total of 4,825 firms were reported to have been assisted, although a large proportion of these (2,000 firms) worked with one large, research-based university.

Figure 4.8 HEIs providing equipment-related services classified by number of firms involved



Source: HEBI survey 2001

5 Managing intellectual property

This section focuses on the extent to which HEIs in the UK are seeking to secure the rights to exploit their IP through patenting, and their success in licensing that IP to companies. Intellectual property rights have been a growing concern in higher education in recent years, both in the UK and overseas, and most countries have seen a significant investment by HEIs in securing these rights.

The management of intellectual property is best seen as a process with a series of stages that correspond with measurable outputs. At the outset, researchers within the HEI may be generating new knowledge, ideas and concepts that have a commercial potential and could be protected through some form of legal IP. Usually an HEI will have an office or department which provides advice to staff about how to protect this idea, and in some cases this is a proactive service, regularly asking researchers about the outcomes of current and future research.

The technology transfer office may then record the idea in the form of a brief description, which can then be disclosed on a confidential basis to potential users, patent agents or others whilst the commercial potential is judged. These disclosures form the first measurable step in the chain.

After initial soundings, the technology transfer office may then decide that formal IP protection should be sought for the idea and an initial patent application filed. This may be a UK patent application or a European patent.

Initial applications last for one year, after which the application must be re-affirmed, subject to an additional and higher payment. Thus the total number of patents filed in one year consists of the initial applications plus those that are being continued. There may then be a delay before the patent is granted, subject to the decision of the patent office that it is indeed novel and is not precluded by the prior existence of another patent or existing knowledge.

The HEI will in parallel seek to license the patent to a company, with the measure being the number of licences issued and the revenue earned from these. Here though there may be no direct relationship between the number of patents and licences, as some patents are licensed to many different companies whilst others may never be taken up.

5.1 Disclosures

The intellectual property identification and protection process described above is a rather formalised description, and not all steps are monitored closely by all HEIs. An example is the formal disclosure of potential inventions. Whilst 78% of pre-1992 universities monitor the number of disclosures made each year, this is not so for post-1992 universities or HE colleges. Less than two-thirds of post-1992 universities monitor the number of disclosures and just over one-third of HE colleges (Table 5.1). The identification and hence monitoring of disclosures is indicative of a proactive IP protection process, where commercialisation units seek to ensure that all potential patentable ideas are identified and assessed in a methodical manner. Without such a process, patents tend to be only pursued on an ad hoc basis largely at the initiative of academic staff.

Table 5.1 Whether HEIs monitor the number of invention disclosures made each year (%)

	Pre-1992 university	Post-1992 university	HE college	Total
Yes	78.3	62.2	35.0	61.3
No	21.7	37.8	65.0	37.8
No. of cases	60	37	40	137

Source: HEBI survey 2001

Consequently relatively few HEIs were able to provide information on the numbers of disclosures compared with those that responded on patenting rates: only 79 (1999-2000 figure) were able to provide details, of which 46 were from the older universities.

The majority of disclosures were made by pre-1992 universities, with a mean number per respondent of 35.48, although this result was heavily skewed by a few HEIs with very large numbers. The median value was much lower at 15. By the following year the total had increased by 13% to 1,760, with the mean increasing to 38.26. Although the median decreased slightly this was due to a higher response rate in this year (46 as opposed to 44 in 1998/99). Within the other HE sectors there was an increase between the two years, although from a much lower level.

Table 5.2 Number of invention disclosures made in 1998/99 and 1999/2000

	1998/99				1999/2000			
	Mean	Median	Max	Total	Mean	Median	Max	Total
Pre-1992 university	35.48	15.0	257	1561	38.26	14.5	227	1760
Post-1992 university	5.83	2.0	20	105	6.67	3.0	27	120
HE college	1.38	0	10	18	2.31	0	15	32

Source: HEBI survey 2001

Overall the number of disclosures rose from 1,684 in 1998/99 to 1,912 the following year, a rise of 13.5%.

5.2 Patenting

Apart from the post-1992 universities, where the response rates were much higher to this question, the numbers of patents filed were inevitably lower than the number of disclosures, due to a proportion of disclosed ideas not being taken forward for protection. Again the results for the three HEI sectors are presented, and show very significant differences reflecting the relationship between patents and research income. Among the pre-1992 universities the median total number of patents filed each year has risen from 11 to 19 between 1998/99 and 1999/2000, the mean being higher due to a few extreme cases. The highest performing institutions were filing over 100 patents per year, similar to the total patents for all the post-1992 institutions that replied to this question.

The table also shows a significant increase in patenting between the two years in the sample, although not for the post-1992 universities. The increase from 1,259 in 1998/99 to 1,534 in the following year was a growth of almost 22%, mainly due to growth among a small group of research-intensive institutions. Only one significant patenting university in 1999/2000 had not provided a figure for the previous year, so only a small part of the change (3.4 percentage points) was due to differential response.

These totals are also higher than the totals recorded in the PREST survey for 1996/97 although it is not clear how comparable the two sample populations are, as a different combination of HEIs may have responded. The PREST survey only identified 594 total patents filed in 1996/97 suggesting a growth of 158%, although in reality much of this change is likely to be due to differential response rates.

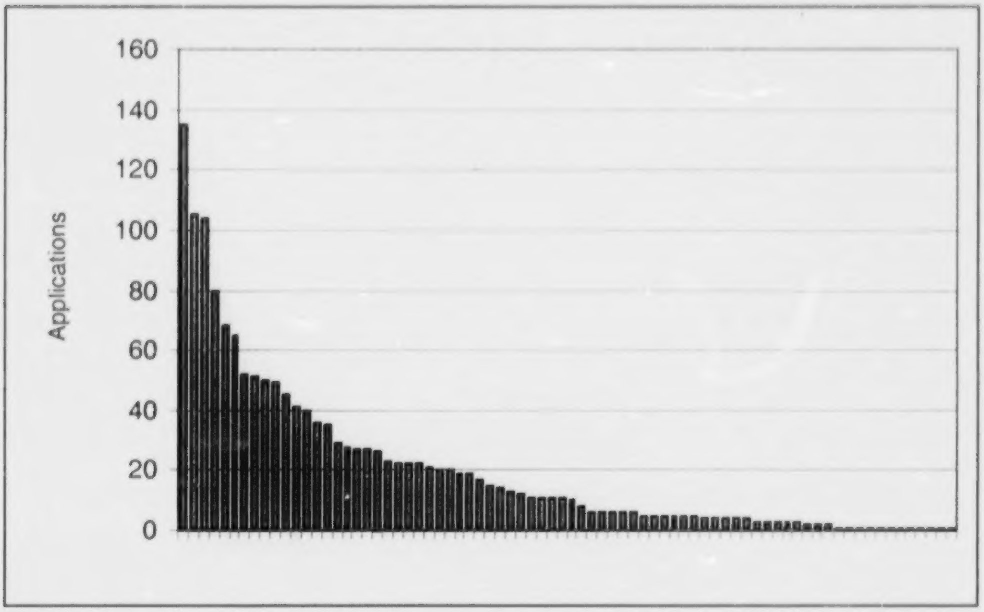
Table 5.3 Number of total UK patents filed

	1998/99				1999/2000			
	Mean	Median	Max	Total	Mean	Median	Max	Total
Pre-1992 university	20.62	11.0	116	1,134	25.31	19.0	135	1,392
Post-1992 university	3.67	2.0	31	121	3.81	2.0	27	122
HE college	0.11	0	2	4	0.51	0	11	20

Source: HEBI survey 2001

The numbers of new patents filed also increased over the two years for the HE colleges and pre-1992 universities, and only slightly decreased for post-1992 universities. Again this could have been due to a slightly smaller sample size in 1999/2000 since institutions had not always recorded data for both time periods. The overall number of 705 was almost twice that of the previous PREST survey (371 in 1996/97), although again it must be stressed that the samples are not necessarily comparable.

Figure 5.1 Total number of patent applications by individual HEIs 1999/2000



Source: HEBI survey 2001 (zero scores excluded)

The numbers of patents granted were much smaller as a consequence of various filtering processes, with only 162 granted in 1998/99 and 188 in 1999/2000. Again though the numbers have increased between the two time periods, and in this case they were also higher than reported in the PREST survey. What is perhaps most notable about the patents granted is that the proportion of the total for the post-1992 universities is very much greater than their proportions of total and new patents filed.

Table 5.4 Number of new UK patents filed

	1998/99				1999/2000			
	Mean	Median	Max	Total	Mean	Median	Max	Total
Pre-1992 university	10.71	6.0	59	557	11.92	6.0	68	620
Post-1992 university	2.43	1.0	14	68	2.48	1.0	15	67
HE college	0	0	1	3	0.50	0	11	18

Source: HEBI survey 2001

Table 5.5 Number of total UK patents granted

	1998/99				1999/2000			
	Mean	Median	Max	Total	Mean	Median	Max	Total
Pre-1992 university	3.02	1	28	136	3.15	1	28	145
Post-1992 university	0.96	0	12	25	1.27	0	9	38
HE college	0	0	1	1	0.14	0	3	5

Source: HEBI survey 2001

The results show that patenting is essentially an activity of the universities in the sample. Table 5.6 shows that the majority of HE colleges take no action on patents, and in the main this will be an appropriate policy given their research profile. Within the university sector, patent filing remains a rather specialist activity which tends to be contracted out to an external agency. Only a minority claim to have developed in-house capability, and these include both universities with high levels of patent activity and some with relatively low levels, suggesting that there is no clear good practice recognised here.

Table 5.6 Whether the HEI has an in-house capability to file patents, or uses an external agency (percentages of each type of HEI)

	Pre-1992 university	Post-1992 university	HE college	Total
In-house capability	35.3	24.2	8.1	24.0
External agency	54.9	63.6	24.3	47.9
No action taken	9.8	12.1	67.6	28.1
No. of cases	51	33	37	121

Source: HEBI survey 2001

5.3 Comparison with North America

The patenting rates outlined above can be compared with those of North American universities using data provided by the AUTM. In 1999 a sample of 139 US universities filed 7,612 US patents of which 4,871 were new patents; 3,079 patents were also issued to the same institutions. A parallel sample of 20 Canadian universities filed 345 US patents of which 206 were new, and 160 US patents were issued.

In order to compare these figures with the UK HEBI survey we need to adjust for the number and size of HEIs: the US sample in particular comprises most of the largest US universities, some of which dwarf the largest UK universities in research income.

Accurate benchmarking is difficult, however, as the key determinant of patent activity is likely to be research expenditure where the HEI has legal rights for IP exploitation, and given that different technology fields will have different ratios of average research expenditure per patent. Furthermore, costs vary between countries: academic salaries are higher in the US so total costs can be expected to be higher.

Given the caveats, how do the UK HEIs compare with the US and Canadian universities? We can calculate the level of sponsored research expenditure in the US and Canadian samples needed for each patent. This can be compared with expenditure on research grants and contracts by the UK HEIs, again divided by the numbers of patents. Taking a conservative approach, the total number of patent filings for the UK sample is coupled with the total research expenditure for all UK HEIs. Table 5.7 shows the results using these cautious figures.

Table 5.7 Research expenditure per patent in the US, Canada and UK

Patent indicator	Sponsored research expenditure per patent (£)		
	US	Canada	UK
Total patent applications filed	1,919,424	2,017,044	1,255,511
New patent applications filed	2,999,518	3,378,059	2,517,019
Patents issued	4,745,259	4,349,251	9,757,333

Source: authors' calculations based on HEBI survey 2001 and AUTM 1999

Using these rough calculations the UK HEIs are seen to be performing well compared with the US and Canadian institutions. The expenditure required per patent filed is generally lower than that in the North American comparators, although this may be expected from the lower cost structure in the UK. It is only in terms of patents issued that the UK performs worse, and here other factors may intervene. It may be that North American institutions have been more willing to pursue patents in the longer term, whilst UK institutions have been more likely to withdraw patent applications early rather than meet the full costs. The larger size of many US universities would give them the greater financial resources to maintain a strong patent portfolio.

5.4 Licensing

Having devoted resources to the protection of intellectual property, then HEIs must seek to license that IP in order to recoup these costs. The search for licence partners seems to be a more commonly undertaken activity in-house than the filing of patents. The vast majority of universities claim to have in-house licensing capability, although again this activity is not common amongst HE colleges.

The numbers of licences executed in each of the last two years seem at first glance to be quite high, certainly compared with the results of previous years, although they are remarkably concentrated among a very few HEIs. In Table 5.8 the percentages of each total accounted for by the five highest scoring HEIs are given to illustrate this point. So of the 238 non-software licences granted to UK-based companies in 1999/2000, 36.6% originated from just five HEIs. For the other groups in the table the concentration was much higher, although these were also smaller groups and hence more easily influenced by modest effort on the part of a few institutions.

Table 5.8 Whether the HEI has an in-house capability to seek out licensing opportunities for its IP, or uses an external agency (percentages of each type of HEI)

	Pre-1992 university	Post-1992 university	HE college	Total
In-house capability	78.0	71.4	19.4	60.0
External agency	15.3	14.3	5.6	12.3
No action taken	6.8	14.3	75.0	27.7
No. of cases	59	35	36	130

Source: HEBI survey 2001

Table 5.9 Number of licences/options executed on the basis of HEI-owned intellectual property over the last two years

	1998/99		1999/2000	
	Total	% top 5	Total	% top 5
Non-software licences granted to UK-based companies	192	37.5%	238	36.6%
Non-software licences granted to companies based overseas	73	53.4%	73	45.2%
Software licences granted to UK-based companies	147	67.3%	144	56.3%
Software licences granted to companies based overseas	61	68.9%	126	80.9%

Source: HEBI survey 2001

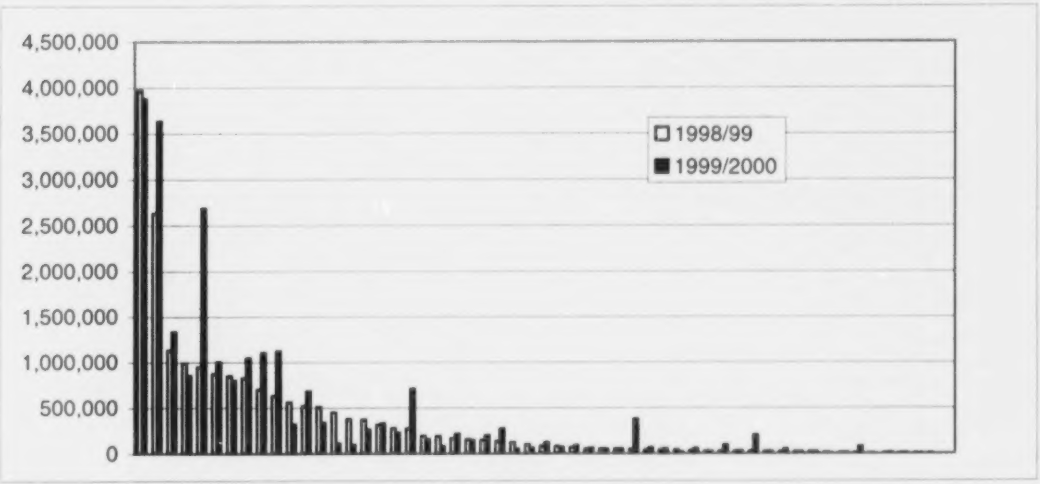
5.5 Revenues and costs

Institutions were asked to provide total revenues and costs for IP over two years. Total revenues for 1998/99 were declared to be £19.2 million (117 responses), and £23.3 million (121 responses) for 1999/2000. However, these figures again do not tally with HESA returns, as the declared total for 1999/2000 recently released was £14.5 million, for the whole sector rather than a sample, and £12.1million for the 121 HEIs that responded to the HEBI survey.

Many of the high income institutions were suggesting much higher levels of income in the survey than in the HESA returns. It is likely that there are differences due to the calculation of gross and net income, to charges for patent protection and payments to individual inventors. For some institutions these reconciliations are made outside the main university accounts in subsidiary commercialisation companies, so the university may report net income to HESA but gross income in the survey. Considerable effort would be required to disentangle all of these issues.

The simple display of the levels of income in Figure 5.2 shows the extreme concentration of income among a small number of universities. It is also clear that such revenues may be highly volatile, with several showing high increases between the two years, and also sharp decreases. Fluctuations of over 50% between two years are not unusual even among those with quite high revenues, supporting the view that most income is from very few deals.

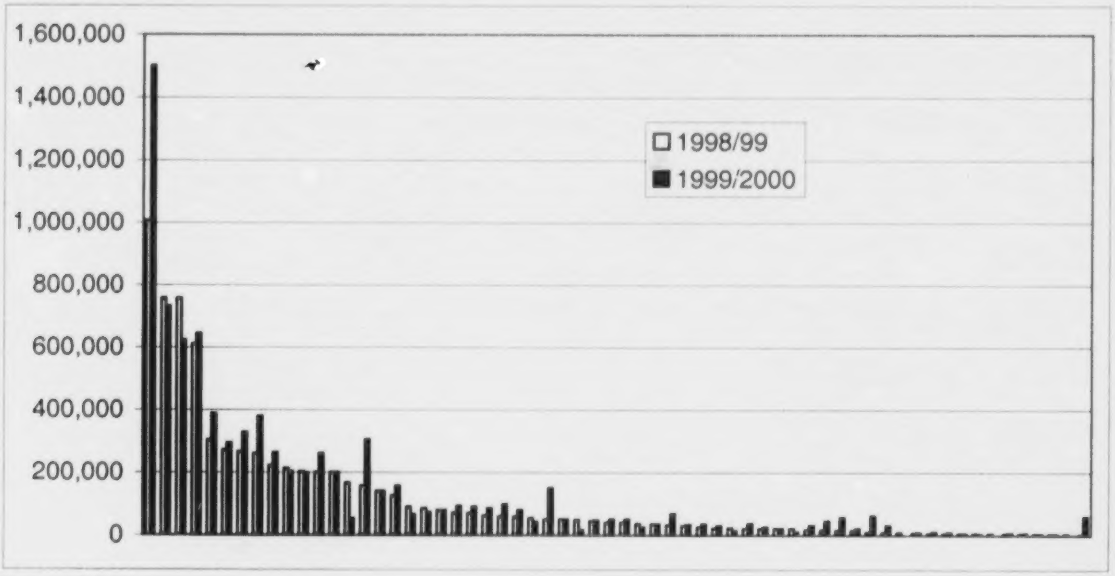
Figure 5.2 Total revenues (£) from intellectual property for individual institutions



Source: HEBI survey

Costs are also highly concentrated among a few institutions, and are also volatile, although perhaps less so than income.

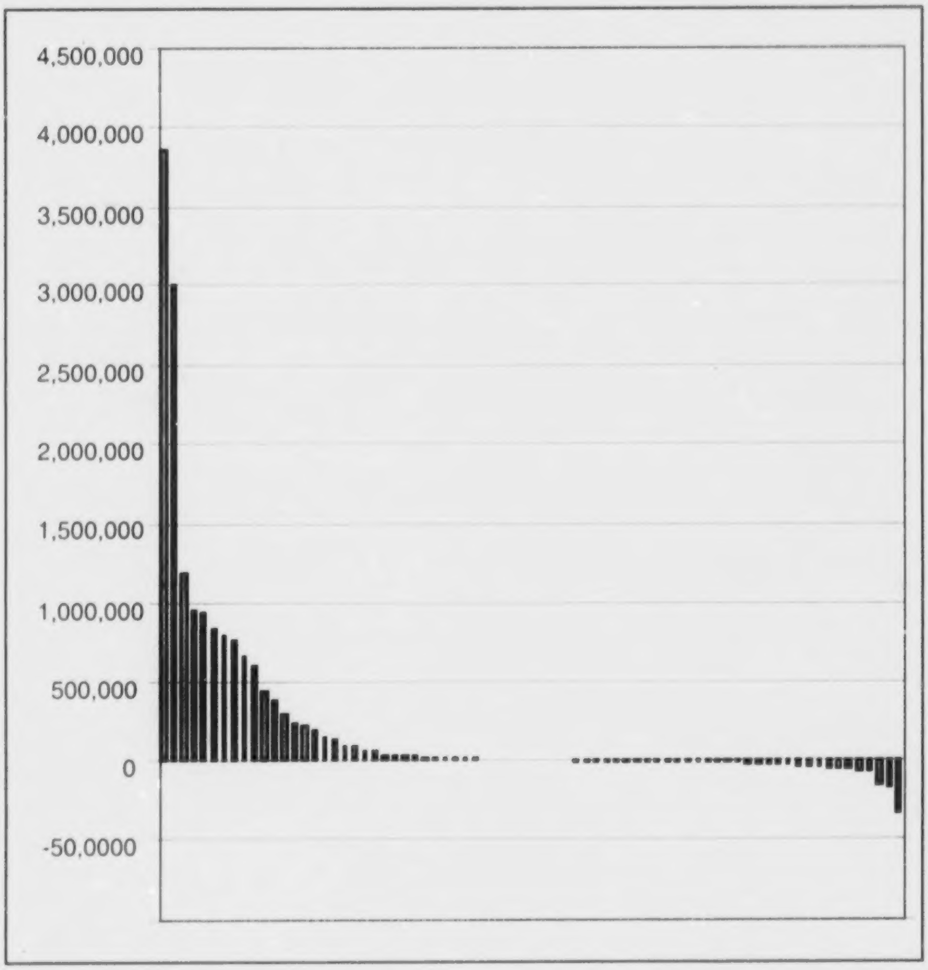
Figure 5.3 Total costs (£) of IP protection for individual HEIs



Source: HEBI survey

If we compare IP revenues and costs to give a crude measure of profitability or net income then we see that only a relatively small number of institutions are generating a significant surplus from IP: only three over £1 million and 10 over £500,000. There may be others which did not provide figures, but there are not likely to be many more. For half of the institutions providing data the costs were higher than the revenues, although there is always the possibility of future income flows from current patent portfolios.

Figure 5.4 IP revenues less costs for individual institutions (£)



Source: HEBI survey, 2001

5.6 IP policy

The emphasis has been placed here on the protection of inventions through patents and subsequent exploitation, but this is not the only form of intellectual property protection that is feasible. Most HEIs either always or usually require staff to report inventions that might need protection, but there is less stress on some other forms of IP.

What is perhaps surprising is that there is an expectation across the range of forms of IP that reporting should be a requirement. In particular, almost half of HEIs suggested that literary or artistic works should always or usually be reported, even though the normal practice has been for copyright of such works to remain with the individual academic. Similarly a growing area of contention is educational software and related 'courseware', often in the form of multimedia. As lecturers turn their teaching notes into electronic packages, the material acquires a potential commercial value, and a majority of institutions seem to be taking an interest in the protection of such IP.

Table 5.10 Current requirement within the HEI to report the creation of the various types of intellectual property (percentage of respondents)

	Always	Usually	Rarely/Never	No. of responses
Inventions	63.2	16.8	20.0	125
Computer software or databases	40.7	35.0	24.4	123
Literary or artistic works	27.0	19.7	53.3	122
Educational software and multimedia	41.7	33.9	24.4	127
Industrial designs	46.7	20.8	32.5	120
Trademarks	51.7	19.8	28.4	116
Integrated circuit topographies	37.6	14.7	47.7	109
New plant or animal varieties	41.8	17.3	40.9	110

Source: HEBI survey 2001

6 Consulting activities

Although academic knowledge can be applied through the exchange of codified forms as in patents, it is perhaps more usual for companies to turn to academics to assist in solving relatively short-term problems. This may involve new research projects as already covered in section 4, but more typically the particular problem may have been faced by other firms, and therefore can be solved by the application of current knowledge. Such activity falls into the category of consulting.

Consulting itself can take many forms depending on the nature and duration of the relationship between academic and company, or on the nature of the service provided. It could involve a one-off advice session of no more than a few hours, or an ongoing deep involvement in a company of perhaps a day a week over a period of years. It may involve technical or management advice to company managers, developmental activities for a group of company staff, expert witness work in legal cases, or information searches outside the company (see UUK/AURIL, 2001 for more details).

Consulting presents a particular set of problems for HEIs. As much of the value is in the personal knowledge and expertise of the academic, some of this work might be considered to be individual work outside the scope of the normal employment contract, in the academic's own time. Certain institutions have taken a view that such work is to be encouraged to compensate for salaries that might be lower than in other sectors, and because there are significant benefits for the HEI in terms of knowledge gained. Often, however, the benefits to the institution are sufficient to require a more strategic approach: the knowledge gained by the academic can enhance other activities within the institution, or the consulting project may lead on to deeper relationships with funded research, training programmes, etc. This further adds to the desire to encourage consulting, but adds a concern that the HEI will want to assure quality in delivery and protect any potential threat to the reputation of the institution, or problems connected with the legal liability of the academic consultant.

Hence many HEIs have been formalising their policies on consulting, seeking to regulate the amount of consulting carried out by individuals, developing schemes to encourage more consulting within the academic contract, and formalising individual consulting through the provision of legal liability insurance.

A central feature is the provision of mechanisms to help companies identify staff that can address their needs, particularly for SMEs that often find HEIs difficult to navigate. Most HEIs provide some form of enquiry point to deal with SME queries, and most of these provide additional assistance to help the SMEs specify their need. In terms of support for staff, the vast majority of institutions now provide indemnity insurance, usually through levying an overhead on contracts. This is especially the case for universities, where 85-90% provide this support. There is also a significant group of institutions that require all consulting to go through an official system, although this is less common within the pre-1992 university sector, where only 57% require staff to use this system as opposed to 81% of post-1992 universities. The HE colleges have a lower tendency to use formalised procedures, but the differences are less marked than for other areas of policy as consultancy is an activity which is just as relevant to this group of HEIs.

Table 6.1 Existence within the HEI of a central dedicated unit providing specific services (percentages)

	Pre-1992 university	Post-1992 university	HE college
An enquiry point for SMEs	81.1	94.6	79.5
Assistance to SMEs in specifying their needs	75.5	83.8	64.1
A required contracting system for all staff-business consulting activities	56.6	81.1	61.5
Indemnity insurance for staff	84.9	89.2	69.2
No. of HEI respondents	53	37	39

Source: HEBI survey 2001

Eighty-eight per cent of all universities have a commercialisation company and/or an internal commercialisation department. On the whole, HE colleges tended not to have a commercialisation company; where any commercialisation activities existed these tended to be internal to the institution.

Table 6.2 Presence of a commercialisation company or internal department to manage consulting links (percentages)

	Pre-1992 university	Post-1992 university	HE college	Total
No commercialisation company or department	10.5	13.5	42.9	21.3
Commercialisation company	29.8	29.7	9.5	23.5
Internal commercialisation department	36.8	37.8	40.5	38.2
Both	22.8	18.9	7.1	16.9
Number of responses	57	37	42	136

Source: HEBI survey 2001

Many institutions are only able to provide limited data on the numbers of firms assisted and the income associated with this, as much of the activity is not centralised, and even where it is there may be considerable activity which is just not declared. Any measure of consulting therefore tends to be focused on that part which has been formalised, and even then it may be difficult to disentangle consulting income from departmental 'other services rendered' accounts.

Eighty-eight HEIs were able to provide estimates of the numbers of firms assisted through consulting for 1999/2000, with 79 also having figures for the previous year.

Table 6.3 shows that there is a polarisation between those institutions with relatively few contracts, typically involving fewer than 25 firms, and those with over 100. For the higher group the range includes one at 3,185, and several in the 400 to 900 category (1999/2000). These are a mix of pre- and post-1992 universities based in a variety of regions. Many of the highest responses come from HEIs in less favoured regions, and may include firms supported through European Structural Funds programmes.

Table 6.3 Number of firms assisted through consulting

	1998/99		1999/2000	
	No.	%	No.	%
0	10	12.7	10	11.4
1-25	19	24.1	19	21.6
26-50	8	10.1	11	12.5
51-100	11	13.9	10	11.4
101-200	18	22.8	20	22.7
201+	13	16.5	18	20.5
Total	79	100	88	100

Source: HEBI survey 2001

A relatively high proportion of consulting contracts are with regionally-based firms, even for some of the institutions with very high levels of consulting. It seems that proximity is important in the sourcing of consultancy by businesses, both to identify academic consultants and to provide regular face-to-face contacts. In 1999/2000 just over 60% of institutions able to respond to this question considered that more than 50% of consulting was with firms in the same region. Support schemes, such as European Structural Funds, will play a part here, as such schemes will only support firms within defined areas, usually the regions immediately surrounding the HEI involved. Hence HEIs will be both seeking local firms to offer consultancy and offering one-stop shop services for local SMEs. However, even large firms based in metropolitan regions usually look to local universities for consultants, unless their requirements are highly specialised or they have a long-standing collaboration with a university in another region.

Table 6.4 Proportion of firms assisted with consultancy that are based in the region

	1998/99		1999/2000	
	No.	%	No.	%
0	2	3.3	2	2.9
1-25	9	14.8	11	15.9
26-50	13	21.3	14	20.3
51-75	14	23.0	14	20.3
76-100	23	37.7	28	40.6
Total	61	100	69	100

Source: HEBI survey 2001

The total income from all HEI respondents for 1998/99 was £51.8 million, increasing to £60.2 million in 1999/2000. This is much smaller than the real total income, partly due to the difficulties of estimating actual levels of consulting, and partly due to the low response rate for this question.

The pre-1992 universities typically have a greater level of income than the post-1992 universities, and both groups of universities have a much higher level than the HE colleges. The mean values for all three groups of HEIs are inflated by a few high outliers, with the mean being significantly higher than the median value. However the differences between the two university sectors are less pronounced than in research terms, and the leading post-1992 universities are reporting higher consultancy income than the average pre-1992 universities.

Table 6.5 Total income from consulting

	Mean	Median	Maximum	No. of respondents	Total
1998/99					
Pre-1992 university	1,345,128	619,414	6,116,000	27	36,318,464
Post-1992 university	596,419	496,470	2,100,000	22	13,121,239
HE college	85,768	22,357	380,000	28	2,402,516
1999/2000					
Pre-1992 university	1,432,274	716,000	6,062,000	27	38,671,416
Post-1992 university	566,496	397,714	1,700,000	22	17,968,102
HE college	125,949	37,500	503,000	28	3,583,416

Source: HEBI survey 2001

7 Spin-off firms

7.1 Categorising spin-offs and start-ups

'Spin-offs' are enterprises, in which an HEI or HEI employee(s) possesses equity stakes, which have been created by the HEI or its employees to enable the commercial exploitation of knowledge arising from academic research. Other 'start-up' companies may be formed by HEI staff or students without the direct application of HEI-owned intellectual property.

Four types of spin-off or start-up firms can be defined:

- Spin-off companies established using HEI intellectual property and in which there is some element of HEI ownership.
- Spin-off companies to which the HEI has assigned or licensed IP, but in which it has no equity.
- Start-up companies involving current or former university staff as founders where the university has no ownership nor an IP agreement (in this case the HEI staff must be connected to the HEI immediately prior to formation of the company).
- Graduate start-up companies that have originated through the direct involvement of the HEI or through a dedicated graduate start-up programme.

The emphasis in this survey has been on the spin-off category where there is ownership or IP links. This relates to the question of the motivation for the HEI to be involved in the process in the form of some kind of financial return on their investment.

The questionnaire did not ask detailed questions about science parks and incubators. This is already extensively surveyed through the UK Science Park Association, and in many cases the HEI has only a minor involvement in the park and may not be in a position to produce detailed statistics. Also most firms in science parks have been found to be of external origin rather than spin-offs, and may be attracted to the park by the image and quality of environment as much as by the desire to be close to or to collaborate with a university (Massey et al, 1992).

7.2 Spin-offs

HEIs responding to the questionnaire reported a total number of 199 firms established in 1999/2000 where there was some form of HEI ownership or HEI intellectual property involved. Ninety-two per cent of these involved some form of HEI ownership. The spin-offs were concentrated in a relatively small number of HEIs: during 1999/2000 only 24 had seen more than two spin-offs with HEI ownership, and these accounted for 136 of the 183 reported.

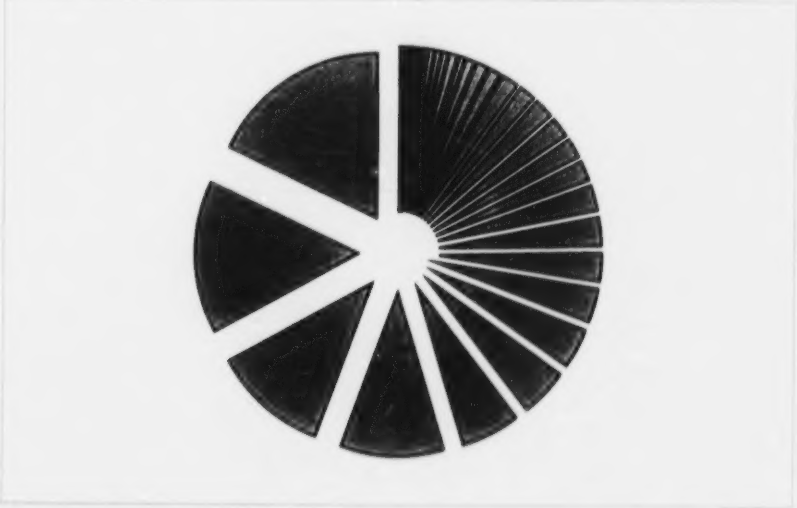
In the previous five years 338 were reported, an annual rate of just under 70, suggesting a significant increase in the rate of formation in the last year or so. The proportion with HEI ownership was slightly lower over this period at only 84%. The growth over time is also demonstrated by the PREST survey which found only 26 spin-off firms established during the 1997 calendar year.

Again there was significant concentration of firms within a small group of institutions. The 10 with the highest number of HEI-owned spin-offs accounted for

169 between 1994/95 and 1998/99, and 84 in the last year. This group was mainly made up of pre-1992 research-based universities, although one post-1992 university was also included.

HEIs were asked about the equity value of their holdings of shares in spin-off companies. Only 45 HEIs declared equity holdings, totalling almost £194 million. Figure 7.1 shows the distribution of equity values between the 45 institutions:over half the equity is held by just four institutions, the largest of which was £35 million. Sixty-two institutions declared no holdings of shares in spin-off companies.

Figure 7.1 Equity value of spin-off portfolio for individual HEIs as proportion of the total



Source: HEBI survey 2001

Only 11 institutions reported income from the sale of shares in spin-offs during 1999/2000, for a total income of £38.4 million. Again this was mainly attributable to an even smaller group of institutions, with only three accounting together for over 80% of this total. However, the low number of reported cases here is not a consequence of non-response, as 110 institutions reported zero income from this source. Only a very few institutions seem to be in a position each year to sell off shares.

Using the same database and methodology as in section 5.3, we can compare the rate of spin-off formation with that in the US and Canada. The AUTM defines a 'start-up' company as a new company dependent on licensing university IP. On that basis this equates to the two types of spin-off defined in this study. The same caveats as before apply, with an additional one that the figures for the UK are for the year following those for the US and Canada.

In the UK a total of 199 firms were identified – one for every £8.6 million of research expenditure. In Canada, 50 firms were identified, one for every £13.9 million. However in the US only 275 were identified, with a ratio of one for every £53.1 million of research expenditure. These figures appear to confound the received wisdom that UK HEIs are much less entrepreneurial than their North American counterparts. They should however be treated with some caution, as there may be differences in the way in which the definitions have been applied, and we do not know the relative success of these companies in the market. However, UK HEIs seem to be making a significant and internationally respectable contribution to the formation of new companies.

7.3 Staff start-ups

Only 25 HEIs reported a total of 48 start-ups by staff without direct HEI involvement during 1999/2000. Thirty-three institutions reported at least one start-up in the previous five years, for a total of 162 companies; although a large proportion of this total was accounted for by two institutions, which reported staff start-up figures of 37 and 50. The quality of response for this category of firms is believed to be much less accurate than for the spin-offs, as in many cases there is no mechanism for identifying or recording such start-ups centrally. In some cases examples are known almost as a result of accidental discovery and through word of mouth. It may also be the case that this type of company is decreasing in relative importance as HEIs invest more heavily in spin-off programmes, thus capturing staff that previously left the HEI to set up a company, often out of frustration over a lack of interest in their efforts (Webster, Rappert and Charles, 2000).

7.4 Graduate start-ups

HEIs were asked to provide estimates for the number of graduate start-up firms, where the HEI played some supporting role or operated a formal graduate start-up programme. In recent years there has been a trend towards the establishment of such graduate entrepreneurship programmes. The intention was to investigate the extent to which HEIs were able to monitor the numbers of such start-ups being formed. Inevitably all HEIs will see a small proportion of graduates move into some form of self-employment or firm ownership. Approximately 1.5% of all graduates are self-employed six months after graduation, but in the majority of cases the HEI itself plays no significant role in this process beyond having equipped the individual through their degree course – examples include self-employed artists and designers.

In the survey 27 institutions were able to report that at least one graduate start-up had been formed during 1999/2000, with a further 66 indicating that none had been formed. Of those providing a score of zero, only one provided a figure of one for the previous five years, suggesting that in most cases the zeros meant no activity to promote graduate start-ups. In total the number of graduate start-ups claimed for 1999/2000 was 179.

Over the previous five years, nine of the 27 HEIs claiming graduate start-ups in 1999/2000 were unable to provide an estimate, and a further seven gave a figure of zero. This left just 11, plus one other, able to provide a figure of one or more for the five-year period. These 12 HEIs suggested that they had been responsible for supporting 56 graduate start-ups over five years. This figure is no more than the annual number of graduates estimated to move into self-employment from an average-sized university according to data from the First Destination Survey. Clearly in the period up to 1999/2000 this has been a negligible activity in most HEIs. However, anecdotal evidence from a number of universities suggests that numbers may have increased dramatically in the last year. Several universities are now known to be running entrepreneurship programmes and incubators for graduates, with considerable early success.

7.5 Managing the process

The responses to the questions on the number of spin-offs show an increase in numbers in recent years. This may be in part due to a number of programmes and initiatives taken by HEIs to encourage the greater development of spin-off companies. HEIs were asked about the kinds of support mechanisms currently being provided either directly by the HEI or through a partner organisation. The main forms of support provided by the HEI itself tended to be in the form of business advice and entrepreneurship training, often primarily targeted at students, but also available to staff.

Thirty-six per cent of HEIs offered on-campus incubators, with an additional 13% providing incubator facilities off campus. In 40% of cases incubator premises were available in the locality through a partner organisation. Science park premises were however less common than incubators.

Finance is also increasingly available, with almost 70% of HEIs having some access to seed corn investment, either through their own or a partner's provision. Venture capital was slightly less common, in only half of cases, and was mainly provided through a partner organisation.

Table 7.1 Support mechanisms for spin-off firms

	HEI provided (%)	Partner provided (%)	None (%)	Respondents (number)
On-campus incubators	36.1	9.8	58.2	122
Other incubators in the locality	13.4	40.2	50.9	112
Science park accommodation	18.6	22.9	59.3	118
Entrepreneurship training	64.8	13.6	32.0	125
Seed corn investment	36.6	35.0	39.8	123
Venture capital	10.1	46.2	49.6	119
Business advice	76.2	41.5	15.4	130

Source: HEBI survey 2001. Note: A specific mechanism could be provided both by the HEI and by a partner, so row totals do not equal 100%

8 Training and personnel links

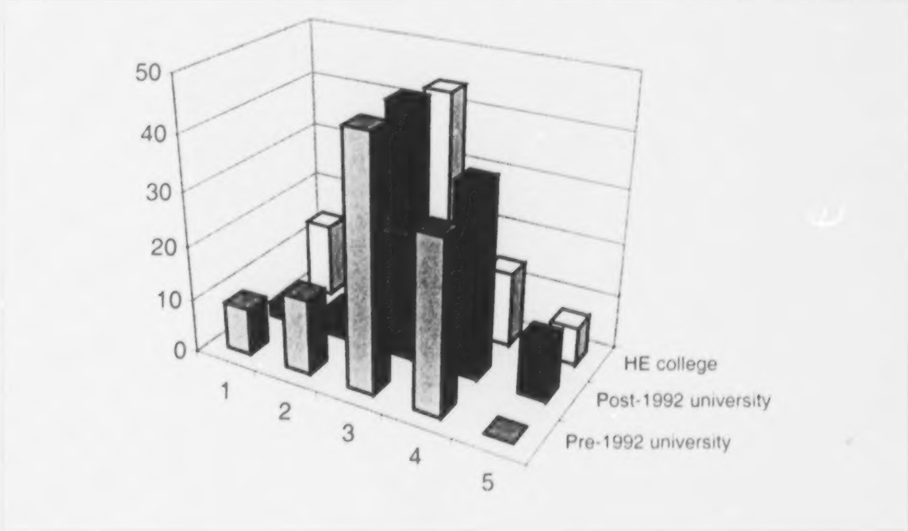
8.1 Benchmarking contribution to the labour market

Important areas of interaction with business remain the core activities of providing a supply of trained graduates, and providing general and bespoke training courses for businesses. As in the earlier section on institutional strategies, benchmarking questions were asked on skills and training issues to assess the extent to which HEIs were actively seeking to understand and meet business needs in this field.

The first question asked about the extent to which the HEI monitors skills needs and sector change though labour market intelligence (LMI), and takes this into account in planning provision. The intention was to ascertain whether HEIs were developing monitoring systems and making labour market intelligence available to departments to assist in the development of new courses and in the redesign of existing courses. The scale used is provided below.

1	2	3	4	5
No monitoring of skills, nor general use of LMI, nor collaboration with employers.		Moderate responsiveness – some changes in provision based on forecasting of demand using LMI, but little ongoing dialogue with employers and other bodies. LMI would typically be examined in central service units but not disseminated and used in departments.		Sophisticated monitoring systems at HEI level, with provision of appropriate data to individual departments. Evidence that information from LMI and employer suggestions are acted upon at central and departmental levels.

Figure 8.1 Extent to which labour market intelligence is used in planning provision (percentages of each grouping)



Source: HEBI survey 2001

The modal group of HEIs in all three categories were those indicating a moderate level of activity, making use of LMI perhaps at a central level without fully embedding this into all departmental planning processes. Amongst all three categories of HEI there was a secondary group that scored 4 on the scale and were making more intensive use of LMI, especially within the post-1992 universities. None of the pre-1992 universities considered themselves to be at the good practice level, unlike 11% of post-1992 universities and 7% of HE colleges. Of the 12 institutions who indicated that they did not monitor LMI, five were pre-1992 universities and six were HE colleges. There was not a strong regional differentiation in the pattern of response.

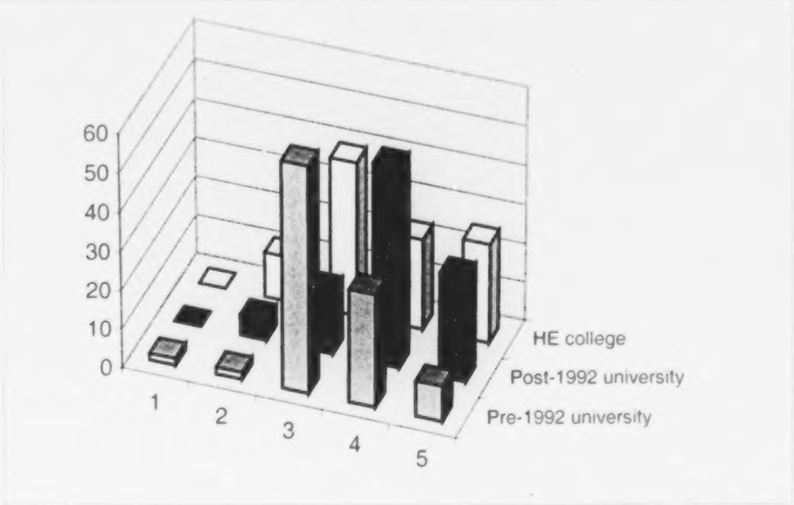
The second benchmarking question focused more directly on the role of employers in the development and regular reviewing of the curriculum. Here the scale ran from those HEIs with no links with employers, through to those where all departments consulted with employers where relevant and courses were updated to meet the needs of employers.

1	2	3	4	5
No links with employers in development of locally oriented courses or overall shaping of the curriculum.		Some dialogue with employers and other bodies about the nature of courses, but limited e.g. to specific vocational areas, or one-off exercises.		All departments regularly consult with employers and other partners on curriculum where relevant. Specialist subjects are kept up to date and relevant to the labour market. More generic skills developed in all courses as required.

In this case there were very few HEIs scoring either 1 or 2, with most having some form of dialogue with employers. For the pre-1992 universities the majority still saw this as an ad hoc exercise limited to specific areas, although a minority (9.1%) considered themselves as meeting the good practice benchmark. It was evident from the scores of the post-1992 universities that there was much more interaction with employers. Twenty-seven per cent indicated that they had regular consultations with employers, and that specialist subjects were kept up to data and made relevant to the labour market. Over half (51.4%) scored just below the highest benchmark. HE colleges also saw themselves as meeting employer needs, and one-quarter scored in the highest category.

The regional analysis of this indicator revealed a slight bunching of responses from the North of England around the 3 and 4 categories, with very few in the highest category. Within the other regions, although the majority clustered again around 3 and 4, in most cases at least 20% indicated that they considered their activities with employers to be at the best practice level.

Figure 8.2 Involvement of employers in curriculum review and development (percentages of each grouping)



Source: HEBI survey 2001

8.2 Placements

A key element in facilitating links between the educational role of HEIs and the interests of businesses is through the placement of students within business. However, in the survey the question which tried to capture placement activity was not answered well. As a result the information on placements is limited and probably not very reliable, especially the proportions of placement students that found work with their employers after graduation. For this reason we have decided to omit this question from our analysis.

Information was however available on the mode of organisation of placements. The most important mechanism was through individual schools or departments, with over 90% of all three groups of institutions identifying this approach. Central placement units were mainly used by post-1992 universities, whilst the careers service was used by all the institutions, although less so by the HE colleges. In a large number of cases placements were organised in an ad hoc way between the student and the business.

Table 8.1 Means by which placements are organised (percentages)

	Pre-1992 university	Post-1992 university	HE college
Via a central placement department	18.5	32.4	22.0
Individual school or department level	92.6	97.3	95.1
Via careers service	57.4	54.1	31.7
Via students union	13.0	18.9	7.3
Ad hoc between students and businesses	59.3	62.2	46.3
Via external intermediary organisation	20.4	13.5	4.9
No. of cases	54	37	41

Source: HEBI survey 2001

8.3 Business oriented courses

Often a more direct relationship between the HEIs and business is in the provision of courses, where the course itself is designed to meet the needs of particular groups of businesses. These may be courses that are publicly-funded but are designed with specific employers in mind, such as undergraduate modules, or courses that have been developed in the anticipation that businesses will pay for their own staff to attend.

In the survey HEIs were asked if they ran courses that were specifically designed to meet the needs of a particular firm or group of firms. In general, HEIs were least likely to offer standard undergraduate degrees or degree modules, and were much more likely to offer sub-degree or masters level qualifications developed specifically for businesses. However, non-accredited courses were most commonly offered, with almost 90% of post-1992 universities running such courses.

There were some differences between groups of HEIs. The post-1992 universities were most likely to have undergraduate degrees specifically designed for businesses, whereas pre-1992 universities were only half as likely to do so, and less than a third offered degree modules designed to meet particular business needs. In each of the categories, post-1992 universities ran a higher percentage of courses designed to meet business needs.

This focus on more bespoke provision for business rather than building business needs into the curriculum came through strongly in the direct training provision for companies: a high percentage of all HEIs provide some form of short course on campus. When it came to provision on the company's premises, nearly all the post-1992 universities had some provision, compared with 70% of pre-1992 universities. The number fell even more for the provision of continuous work-based learning, and here the HE colleges also made little provision.

Table 8.2 Existence of courses that were specifically designed to meet the needs of a particular firm or group of firms (percentage for each type of HEI)

	Pre-1992 university	Post-1992 university	HE college
Undergraduate degree modules	30.4	47.2	27.9
Undergraduate degree	25.0	50.0	16.3
Masters degree	64.3	66.7	18.6
Diploma	42.9	58.3	23.3
Non-accredited course	67.2	89.2	44.2
No. of cases	58	37	43

Source: HEBI survey 2001

Table 8.3 Provision of training for companies (percentages for each type of HEI)

	Pre-1992 university	Post-1992 university	HE college
Distance learning for businesses	55.0	78.4	34.9
Continuous work-based learning	45.0	75.7	26.2
Short bespoke courses for business on campus	83.3	94.6	69.8
Short bespoke courses at companies' premises	70.0	97.3	58.1
No.of cases	60	37	43

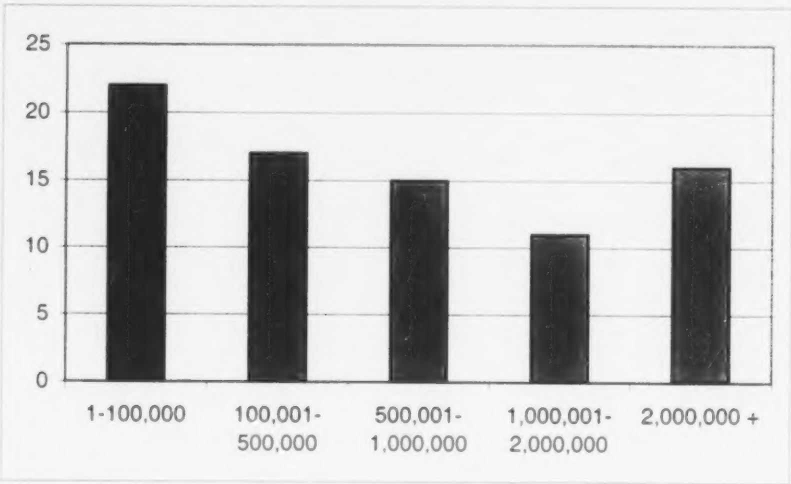
Source: HEBI survey 2001

On this last question there is little regional differentiation except for a low score for distance learning and work-based learning in southern regions, but this may largely be as a consequence of there being more HE colleges in these regions.

A relatively small proportion of HEIs were able to identify exactly how much revenue they gained from the provision of continuing education and training to companies, largely because there are no systems to separate company training from that provided for other organisations or individuals. From the 81 institutions that responded to this question, a larger proportion of pre-1992 universities were in the highest income group whilst a greater number of post-1992 HEIs were in the £500,000-£2 million groups. The majority of HE colleges received revenue from training of £1-£100,000.

On a regional basis, institutions in northern England and in the Midlands and South-West group received revenue of £500,001-£1,000,000 on average from training and continuing education. Some institutions in London and the South-East and in Scotland and Wales received higher amounts.

Figure 8.3 HEIs' annual revenue from continuing education and training (£)



Source: HEBI survey 2001

9 Regeneration

9.1 Involvement in regeneration programmes

In this section we focus on specific programmes with a regional or local economic development objective, and in which universities may be involved.

The growth of the partnership principle in many aspects of regional, urban or local development policy has been seen in the emergence of programmes such as City Challenge and the Single Regeneration Budget (SRB). In parallel, existing programmes such as ERDF and the European Social Fund (ESF) have been opened up to a wider range of organisations, including universities, and have taken a more collaborative form in many cases. As can be seen from the table, the majority of universities have been involved in at least one of these kinds of programmes over the past two years.

Some programmes are only open to HEIs in specific regions, such as the ERDF, the SRB and City Challenge, but generally HEIs have been very active at ensuring they have accessed those funds for which they were eligible. The recruitment of regional and European funds officers has brought a more professional approach to participation in such programmes. Usually this is undertaken on an institutional basis rather than through individual departments.

Table 9.1 Involvement in regeneration programmes (percentages for each type of HEI)

	Pre-1992 university	Post-1992 university	HE college
European Regional Development Fund	46.7	62.2	33.3
EU Community Initiatives	58.3	91.9	35.7
European Social Fund	68.3	89.2	50.0
Single Regeneration Budget	21.7	56.8	14.3
City Challenge	6.7	8.1	0
DfEE Higher Education Regional Development Fund/ Skills Development Fund	31.7	67.6	21.4
Other local economic development programmes	26.7	45.9	23.8
No. of cases	60	37	42

Source: HEBI survey 2001

The scale of this involvement can be judged by the resources involved. HEIs were asked about their income from various regeneration-type programmes in 1999/2000, the results of which are summarised in Table 9.2. The role of the European programmes is significant, and underpins much of the local activity with small firms and with community groups. The aggregate sum of £148 million is equivalent to the total income of a medium-to-large university, and is the largest element within the third strand activities. It encompasses a huge diversity of activity, much of which is summarised within the recent Regional Mission reports published by Universities UK (Charles and Benneworth, 2001).

Table 9.2 HEIs' Income from regeneration programmes 1999/2000

Source	Total for UK HEIs (£)
European Regional Development Fund revenue projects	43,727,375
European Regional Development Fund capital projects	15,845,438
European Social Fund	60,397,530
Single Regeneration Budget	9,585,931
Other programmes	18,970,898
Total	148,527,172

Source: HEBI survey 2001

9.2 Role of regeneration programmes

HEIs are becoming involved in regeneration programmes for a wide range of reasons. Involvement brings access to resources that can be used to address other missions in terms of developing new training courses, enhancing research infrastructure, or enhancing the estate through new buildings. The art of bidding for such programmes is to identify projects that meet the development needs of the institution whilst delivering the community or business development objectives of the funding scheme.

The HEIs were asked about those reasons which were appropriate to them in accessing regeneration programmes, and to identify the three most important. Overall the reasons most often identified within the top three were additional funds for teaching activities, building links with industry, and providing new services to industry. Least important were acquiring research equipment, enhancing knowledge of labour market requirements, and enhancing the redesign of the curriculum. However, there were significant variations between the different types of HEI.

Taking all appropriate reasons, the most frequently mentioned reason was 'facilitating partnership', along with building strategic links with industry. Pre-1992 universities were more inclined to mention additional funds for research and capital projects, but otherwise post-1992 universities tended to mention almost all reasons more frequently.

Focusing on the three most important reasons for each institution, the pre-1992 universities were more likely to pick out strategic links with industry, partnerships, and funds for research. Although only a minority identified research equipment as a reason, these were also concentrated in the pre-1992 university sector. Post-1992 universities focused on new services to industry, whilst HE colleges rated community development more highly than the universities, and partnerships and additional funds for teaching.

Table 9.3 Role of regeneration programmes for the HEI (percentage response from different types of HEI)

	Pre-1992 university		Post-1992 university		HE college		Total	
	All appropriate	Top three	All appropriate	Top three	All appropriate	Top three	All appropriate	Top three
Additional funds for teaching, training	79.2	56.0	81.1	55.9	72.4	63.3	78.2	57.9
Additional funds for research	69.8	32.0	59.5	17.6	48.3	23.3	61.3	25.4
Enabling capital projects - new building/accommodation	47.2	24.0	40.5	20.6	31.0	16.7	41.2	21.1
Acquiring research equipment (used also by industry)	34.0	14.0	45.9	2.9	27.6	3.3	36.1	7.9
Building strategic links with local industry	77.4	56.0	91.9	52.9	75.9	36.7	81.5	50.0
Fulfilling regional mission through new services to industry	67.9	40.0	89.2	64.7	79.3	43.3	77.3	48.2
Facilitating partnerships	75.5	44.0	97.3	35.3	89.7	50.0	85.7	43.0
Enhancing knowledge of labour market needs	52.8	6.0	64.9	5.9	65.5	13.3	59.7	7.9
Enhancing redesign of curriculum	43.4	8.0	64.9	8.8	48.3	10.0	51.3	8.8
Facilitating community development	49.1	10.0	67.6	17.6	72.4	30.0	60.5	17.5
Other	3.8	0	13.5	11.8	3.4	3.3	6.7	4.4
No. of cases	53	50	37	34	29	30	119	114

Source: HEBI survey 2001

At the regional scale the main differences were notably low scoring by the southern England HEIs for capital projects, research equipment, and labour market reasons. The northern England institutions tended to rate most reasons more highly, perhaps reflecting a broader engagement with these programmes through access to the ERDF. However in Scotland, Wales and Northern Ireland there was a downplaying of new services to industry, labour market projects, and community development.

Table 9.4 Role of regeneration programmes for the HEI (percentage response from different regions)

	NW/YH /NE	EM/WM/ SW	L/SE/ E	S/W/ NI
Additional funds for teaching, training	76.9	66.7	84.6	81.5
Additional funds for research	65.4	51.9	61.5	66.7
Enabling capital projects – new building/accommodation	46.2	59.3	23.1	44.4
Acquiring research equipment (used also by industry)	50.0	40.7	17.9	44.4
Building strategic links with local industry	84.6	85.2	71.8	88.9
Fulfilling regional mission through new services to industry	96.2	81.5	71.8	63.0
Facilitating partnerships	92.3	88.9	82.1	81.5
Enhancing knowledge of labour market needs	73.1	70.4	51.3	48.1
Enhancing redesign of curriculum	69.2	55.6	46.2	37.0
Facilitating community development	92.3	55.6	53.8	44.4
Other	3.8	7.4	7.7	7.4
No. of cases	24	26	36	26

Source: HEBI survey 2001. Regions: North-West (NW), Yorkshire and the Humber (YH), North-East (NE); East Midlands (EM), West Midlands (WM), South-West (SW); London (L), South-East (SE), East (E); Scotland (S), Wales (W), Northern Ireland (NI)

Participation in the programmes is not without problems, however, and HEIs do struggle with the burden of regulations and financial complications of these schemes. Almost all institutions identified administrative burdens and the requirement of matching funds as problems they had experienced, although pre-1992 universities had fewer problems with partnership management. The administrative requirements are typically much more intrusive than for research projects, and varied greatly between programmes. Matched funding needs also tend to vary, both in level and in eligibility and complexity. The ESF is particularly complex, with specific exclusions from allowable overheads, and a requirement for both public and private elements of matched funding. Pre-1992 universities tended to be more concerned about inadequate funding rates and eligibility rules, perhaps as a consequence of their greater dependence on research income with more generous overhead rates. Timing was a general concern across all sectors of HE, but particularly for HE colleges.

Table 9.5 Specific problems experienced in regeneration programmes (percentage response from each type of HEI)

	Pre-1992 university	Post-1992 university	HE college	Total
Administrative burdens	91.7	88.6	84.6	89.0
Matching funds requirements	77.1	82.9	61.5	75.2
Timing of bidding process	62.5	65.7	76.9	67.0
Difficulties of partnership management	39.6	54.3	53.8	47.7
Inadequate funding rates	81.3	62.9	69.2	72.5
Eligibility rules	60.4	57.1	46.2	56.0
Co-ordination problems internal to the university	37.5	42.9	50.0	42.2
Other	6.3	14.3	0	7.3
No. of cases	48	35	26	109

Source: HEBI survey 2001

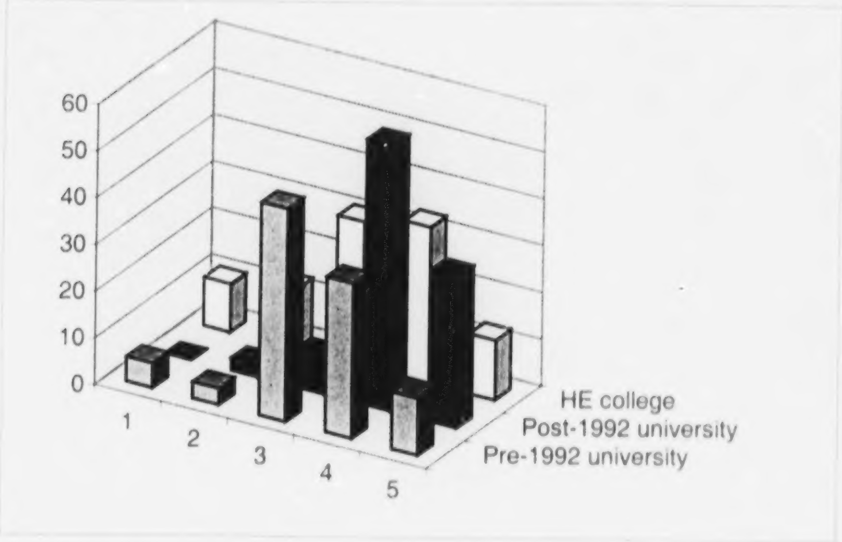
Linked with these issues of participation in regeneration schemes, HEIs were asked to assess their own commitment to partnership arrangements with local and regional bodies using a benchmarking scale.

1	2	3	4	5
No engagement with community regeneration schemes, apart from individual efforts.		Some representation of the HEI on local partnerships at senior management level, but with limited implementation capability. Main focus is on research role and possible property development role.		Active and creative engagement with community programmes, with the HEI taking a leadership position and applying a wide variety of resources. Community regeneration seen as a mainstream activity with role for access policy, link to student community action, and staff involvement as part of staff development.

The highest ratings tended to be for the post-1992 universities, with almost 90% considering themselves to be at or near the good practice level. In contrast the pre-1992 universities were more likely to consider themselves to have limited implementation capability. HE colleges had a more varied response overall with some scoring more highly than the post-1992 universities, but others with low scores.

At the regional scale the HEIs in London and the southern regions tended to score lower on average, as on many of the other indicators, partly due to the greater number of HE colleges. In the northern English regions only one institution considered itself to have no engagement with community regeneration schemes. The remainder considered themselves to have at a minimum some representation of the HEI on local partnerships at senior management level. HEIs in the other two groups of regions clustered around 3 or 4 on the scale.

Figure 9.1 Partnership arrangements with local and regional bodies (percentage of each type of HEI)



Source: HEBI survey 2001

10 Issues of data collection and the development of systems

The objectives of the study included:

- To establish and test the robustness of selected indicators which might later inform decisions on further targeted funding for knowledge transfer activities.
- To assess the opportunity costs of an annual survey against the value and utility of the data collected.

So in addition to establishing the nature and scale of business interaction, the study was required to examine the extent to which it was possible to collect meaningful data through a questionnaire, without imposing unreasonable demands on the HEIs. It is always possible to generate data, but do the data provide an accurate and meaningful interpretation of the phenomenon being investigated? All data collection has a cost, but the cost should not be excessive and should not deflect from the main objectives of the HEIs and of the HE funding bodies.

In order to judge the burden placed on them, HEIs were asked to comment on the time and cost of completing the questionnaire, on questions that were difficult or impossible to complete, and on the format of receiving and returning questionnaires.

In parallel a sample of 25 HEIs were interviewed by phone to explore these issues in more detail. The institutions contacted for this survey were assured of confidentiality: individual responses were not passed to the funding body. The approach was to be completely non-judgemental, with the institution not being evaluated on the responses, and with the objective being to improve the future effectiveness of such surveys and to lighten the future burden of response.

The 25 HEIs contacted were selected to be a representative sample of size, age, mission, and location (Tables 10.1 and 10.2). They ranged from small specialist colleges to large research-based universities, and including institutions with distinctive regional missions and others with a highly international orientation. Some had a strong reputation for industrial and business links whilst others were regarded as more academically based.

Table 10.1 Survey of burden for HEIs: sample by date of formation or entry into university sector

Type of institution	Number selected
Pre-19th Century	2
19th Century (civic-redbrick)	5
1900-50	2
1950-70 (Robbins expansion)	5
Post-1992 and HE colleges	11

Table 10.2 Survey of burden for HEIs: sample by geographical location (region)

Region	Number selected
North-East	1
North-West	2
Yorkshire & the Humber	2
East Midlands	2
West Midlands	2
South-East	3
East of England	2
South-West	2
London	4
Scotland	2
Wales	2
Northern Ireland	1

Each of the institutions was contacted initially through a call to the vice-chancellor's or principal's office, to identify to whom the questionnaire had been passed. This person was then contacted by e-mail to ask if they were willing to be interviewed by telephone for the survey on the burden of providing the data. A brief telephone interview, usually of around 30 minutes, was then conducted by a project team member. The notes of the interview were transcribed and used to prepare the report which follows.

The majority of institutions responded very positively and an interview was arranged soon after initial contact, although we quickly discovered that in some cases it was better to wait until the questionnaire had been completed to get a full response. Of the 25 HEIs contacted for interview, 24 were completed.

10.1 Appropriateness of survey

In general there was support within the HE sector for the objectives of the questionnaire in terms of measuring the nature and scale of business interaction and communicating that. It was felt that investigations of this kind were appropriate, subject to the nature of the specific questions and indicators, their timing and their use. There was widespread recognition of the public interest in the contribution of HE to business and the economy, and that there was a need for accountability.

Other agencies were also asking HEIs for similar information and hence for some HEIs there was little difficulty in providing it, although a concern that the data requirements could be standardised. In Scotland and Wales there was considerable demand for this kind of information already from the devolved bodies, whilst in

England the RDAs were expressing through their enterprise directors a new demand for detailed information on business interaction.

Within the HEIs there was a growing need for better data on enterprise links and performance, for management concerned with the implementation and monitoring of commercialisation and reach-out policies. Several respondents responsible for business development found the questionnaire useful to support their own needs for better data. Often the questionnaire showed up existing data collection inadequacies, where HEIs have typically invested in systems that deliver only that which is required by the HE funding bodies and no more.

Some institutions have already identified data collection and management as a key element of their HEROBC bids. The questionnaire reinforced these efforts and exposed weaknesses, especially a lack of centralised data. A common problem was the need to gather information currently held only at the faculty or department level. It had been anticipated that different central services might be involved in the completion of the questionnaire, but perhaps not that in so many cases information needed to be gathered from the faculties.

Although generally views were positive, there were also some negative views. A central concern was the mix of factual, qualitative and strategic information, and hence its accuracy and confidentiality. The questionnaire combined factual indicators on levels of income or numbers of firms with qualitative questions that requested a self-assessment of the nature of the HEI's strategy. This prompted two main critiques: first, whether the factual indicators are the most appropriate; and second whether the qualitative indicators reflect an appropriate model of business interaction, and whether they accurately reflect the state of strategy in the individual institutions. In particular, the nature of the benchmarking questions as self-assessed and judged often through negotiation were seen to lack the rigour and consistency that HESA data require.

The question as to whether the basic model is appropriate was a reflection of a view that there were other perspectives on business, and forms of interaction. One view that was that national indicators were not necessarily appropriate given the differentiated approaches to business interaction. One vice-chancellor argued that the HEI should be able to set its own performance indicators based upon its institutional plan and HEROBC programme. A related comment concerned the purpose of business interaction: income generation or public interest. The balance of these will significantly affect the choice of indicators.

The biggest concern, which was in fact addressed in the present survey, was over individualised data and its publication. Experience of the use of all kinds of indicators to produce a whole series of league tables led to concerns that this would become another league table, trivialising some approaches at the expense of others and artificially setting the business agenda around a set of indicators that may not be appropriate as objectives.

10.2 Burden

A specific concern at the outset of designing the questionnaire was the time and effort needed to complete it. Some of the questions required considerable detailed and disaggregated data, which would only be easily available if appropriate systems were already in place.

In the questionnaire response, 102 institutions were able to provide estimates of the time taken to complete the questionnaire, albeit rather rough estimates in many cases. The mean time taken was 24.5 hours, although this was skewed by some extreme cases such that the median value was only 10.9 hours. 38.2% of HEIs had spent one day or less completing the questionnaire, but two-thirds of these were HE colleges, reflecting the relatively low relevance of many of the questions to the colleges and the small size of the institutions.

Table 10.3 shows the differences between types of HEI in the effort required to complete the questionnaire. Inevitably the more research-intensive pre-1992 universities tended to spend longer on the questionnaire, although there were some outliers. Three post-1992 universities spent more than two person-weeks on the questionnaire, as did four pre-1992 universities, whilst seven of each group took less than one day. In the main, however, the older more research-intensive institutions tended to be concentrated around one or two weeks, whilst the new universities were concentrated around one to three days. Only one HE college took more than three days: 78% of colleges spent less than one day on the questionnaire

Table 10.3 Time taken to complete the questionnaire: mean and median for different types of institution (staff hours)

	Mean time taken	Median time taken
Pre-1992 university	35.7	24.5
Post-1992 university	28	16
HE college	6.8	4
Total	24.5	10.9

Source: HEBI survey 2001

Institutions also typically costed completion of the questionnaire in terms of the time needed at a compound day rate. It was interesting to note the types of day rates quoted in this exercise, ranging from £27 per hour to £125 per hour. Assuming the data collection and questionnaire preparation were mainly done by fairly senior administrative staff, then the higher costs imply a significant overhead calculation. Figures of around £400 per day are realistic costs for research costs with full overheads, but such costs may not be entirely appropriate in this case.

Overhead recovery rates quoted for research recognise that in addition to the direct costs of undertaking research there are administrative and infrastructure costs which need to be covered. Some of these costs include the operation of financial control systems and production of management information, involved in the task of replying to questions. So it could be argued that this activity is an overhead itself on the research activity of the institution. Some other overhead costs include the provision of a library and research computer network, which may be deemed to be irrelevant to the exercise of completing the questionnaire. Thus the estimation of an appropriate overhead for such administrative tasks is problematic, but essential to the estimation of the cost, as normal HEI overheads are in the region of 100% of staff costs.

Estimations of costs were much less frequent than estimations of time involved. Even among the interviewed HEIs some were unable or unwilling to give a cost, and so there is insufficient data to estimate costs directly. However, applying a 'typical' cost per hour to the 102 responses that provided a time estimate will give a sense of the total investment, and this can be grossed up accordingly. The 102 HEIs spent a total of 2,501 hours, and at a 'reasonable' average cost per day of £300 that would give a total cost of just over £100,000. This would give £120,000 if grossed up proportionately to include those who did not give cost estimates, and a likely cost of perhaps £150,000 for a full response from all HEIs. (The marginal cost of including all HEIs will be reduced as the non-respondents are strongly biased towards the HE college sector.)

These cost estimates have a number of caveats though:

- The true cost includes significant ongoing investment in data entry and accounting systems, which is needed for other purposes in terms of institutional management. If there were to be new requirements for more rigorously auditable figures such as the questions in this survey, then there would be a significant increase in these costs, at least whilst systems were enhanced. These investments may be sensible for other reasons of accountability, and better management of the business interaction function, but nonetheless would be real additional costs.

- If these questions were an annual formalised requirement and information systems were revised, then the cost of completing the questionnaire itself would be potentially less as data would already be available. The aggregate cost was inflated by those institutions that had to check back over individual contracts and search for data.

- The estimates for time and costs are for partially completed questionnaires, and some of the more difficult questions were poorly answered, or answered on the basis of estimates. In one case a sample of contracts was checked and the results grossed up. Full compliance with the present questionnaire would impose a significant increase in costs, but it is likely that a less demanding requirement would be suggested.

- Although the costs could be seen as high, especially if ongoing investments were included, the net additional cost is very small compared with the Research Assessment Exercise. It is not unreasonable to suggest that a large research-active department in the year before the RAE might spend at least £20,000 on preparing their submission, excluding central university support. The whole cost of the HEBI survey might therefore be less than the RAE costs for a single faculty in a research-based university.

10.3 Standardisation

The cost of compliance is closely related to the standardisation of the data requirements and the stability over time of indicators. If, for example, there is a known requirement to monitor the proportion of research contracts with industry that are with SMEs, then research contract services can add a suitable flag to contract databases to enable the easy retrieval of data on the number and value of contracts with SMEs. The biggest problem with the current survey was that, in the absence of such prior requirements and suitable database systems, a response required manual checking of all contracts, even if there was some information on the criterion specified. In the case of SMEs there was often no information at all available to the administration on whether a research partner was an SME or owned by a multinational.

Hence, given the long lead-times of putting such systems into place, concern was expressed about the lack of adequate prior notice on data requirements and the short response time to the specific questionnaire. In this case the survey was aiming to combine two functions – of gathering information that was timely and developing the concept of future surveys, and so in a sense is part of the prior notice process. But as a consequence the results need to be seen in this light, as best estimates which could be tightened up significantly in future years as indicators become institutionalised.

There was a general demand for the standardisation of the data request, preferably in the form of an annual survey to a common format, giving time for the HEIs to develop appropriate systems to respond easily, rather than ad hoc surveys that changed from year to year. It was recognised that these data would be required on an ongoing basis, and so having stable requirements would make it much easier for HEIs to respond.

A particular issue was the deadline. The questionnaires went out with a deadline of around a month, yet many institutions took considerably longer to respond. Why should this be the case when in the interviews and on the questionnaires the HEIs indicated that completion only took a few days' work split across five or six people?

First there were delays in passing the questionnaire through the organisation, from the vice-chancellor's office to the staff responsible for completion, and then difficulties in getting all the elements from individuals with varying levels of workload. Given the lack of a precise warning, and a perception that the questionnaire should be completed in between other tasks, it proved difficult for institutions to co-ordinate completion within a tight timetable. This would be improved by having a regular fixed time of submission each year.

Second there were delays due to missing data. Two institutions interviewed still claimed not to have all the data for 1999/2000 even though all financial data should already have been declared to HESA. Others needed to gather information from the faculties as some data had never been collected centrally before. Again, whilst the time involved for data analysis was not great, the co-ordination time was extensive.

Third, there was an overlap with the RAE submission period and specifically with the completion of the RA4 finance forms, which had a knock-on effect on the completion of section B on research contracts. Essentially the same staff were needed for questions B1 and B2 as were involved in finalising the B4 forms for each RAE unit of assessment. This tended to affect only certain institutions.

Given these points about timing and the need for advance warning and the programming in of data preparation, the HEIs were asked what was an appropriate time of year for the exercise.

This produced a very varied response from the interviewees, but January to April tended to be popular as it was sufficiently long after the end of the financial year for financial data to be available. Some requested the summer months, although this would further delay the production of statistics, and would be less desirable in policy terms. Some suggested November to December although this may be too early for many, due to the need to have completed financial reporting and the timing of other HESA reports.

10.4 Specific questions

The development of a standardised questionnaire for use in future years requires the assessment of the ease of completion of particular questions and their usefulness in policy terms. Here we will simply consider the level of difficulty of completion of individual questions, as reported in the interviews and as seen in the questionnaire responses.

Overall there were few problems with the qualitative questions, such as those in section A on strategies (see copy of questionnaire attached as Annex A). Whilst there were other potential criticisms of these questions for their reliability and appropriateness, they were easy to complete and there were few omissions.

The biggest problem was with section B on research collaboration. This section had the most reported difficulties, uncompleted returns and queries. It is worth noting at this point that the questionnaire contained telephone and email contacts for advice on difficult questions or help with definitions. Around half of respondents made some contact to check on specific questions or to explain late delivery, and the majority of these calls related to section B.

The main problems were as follows:

- A difficulty in understanding what was required for questions B1 and B2 in terms of identifying the level of grant income associated with business collaboration, and the nature and location of contract research income.
- Problems in understanding the differentiation of grants and contracts. Essentially we wanted to differentiate between those grants from public bodies where the HEI specifies what they want to do, but does so in collaboration with business, and those contracts where the HEI agrees to perform research on behalf of a firm or public body. Existing HESA returns provide the total value of grants from research councils and income from industry sources, but do not distinguish how much of the grant income involves collaboration. Many research council programmes now require industrial collaborators, but by no means all.
- There were definitional problems concerning what was a business (did it include the NHS was one question), and which programmes were operated by OST.
- Most HEIs had no existing breakdown of business-related research council income, and this tended to be one of the most labour-intensive elements of the survey as each grant needed to be manually checked.

- There were also great difficulties with the regional breakdown, as systems did not routinely record region. So addresses needed to be checked, and the address of the contact might not reflect the location of the partner branch in a multi-site firm. A related issue was that in some parts of the UK there was a very vague understanding of the concept of region. Clearly in the devolved areas such as Scotland there was clarity, and some acceptance that this was an important issue as this related to the territory covered by the funding council, but in England there was some variation in perception. In London and the South-East the biggest issue was the regional boundaries: central London HEIs regard the surrounding counties as part of their region, but the government boundaries separate London as a distinct unit. Elsewhere there was some confusion over precise boundaries, and problems for HEIs lying near the edge of regions, and with campuses in more than one region.

- Some institutional databases had no data on the location of a company, only perhaps an invoicing address.

- A comment made by a number of institutions with a strong health role concerned the status of the NHS. For these institutions the NHS was the core and most appropriate partner, and was regarded by them as a 'business' stakeholder. However in the survey we regarded the NHS as public sector and therefore excluded. This created some concerns that those institutions would appear to be less engaged, when in reality their engagement was simply directed strongly at a major public sector 'business'. It is suggested that the decision to regard the NHS as public is entirely appropriate, but it signals the importance of not over-emphasising the need for business interaction at the expense of other equally valid public policy outcomes.

- As already noted, the question relating to the proportion of contracts with SMEs presented significant definitional problems. Currently most HEIs do not record details on SMEs except where particular funding sources require it, such as in ERDF projects. One of the problems in future will be where, within the HEI, the check on SME status is made. Often it is only the department in direct contact with the firm that will be able to check whether it is indeed an SME. But the convoluted and arms-length nature of ownership means that a research partner may not be aware of the true ownership status, and this status may change during the course of a project.

- Finally in section B there were significant problems with the question on income from equipment-related services to industry. There are definitional questions here, but a more important issue is that such small scale income is often dealt with at departmental level, and merged with a range of other consulting and training services, so few institutions have accurate centralised data.

Section C of the questionnaire on intellectual property presented few problems for institutions. Many of the smaller HEIs had little to declare, and large research-based universities already have good tracking systems for these indicators. The indicators themselves are becoming internationally standardised, and fit with the US AUTM definitions, so there were no real surprises. Only one large research-based university reported difficulty in monitoring such information, which was presumably a reflection of problems in its own internal IP management systems.

The main problems with the consultancy data (section D) was concern that the full activity of the HEI was not captured, as there is often no requirement for reporting to a central body. Staff either do consulting outside the HEI, and hence it is not recorded, or do work through the department but it is submerged within 'Other services rendered' accounts. It was for this reason that the question asked for centrally monitored activity only, but it was clear that the scale of under-reporting was significant and variable between institutions.

There is perhaps a need for better guidance for institutions on policy for and reporting of consulting. One particular area of confusion was over the status of consulting as an 'other services rendered' activity and its VAT status. Some institutions regard work that is done on a day-rate basis and charged with VAT as consulting, but some of this activity may also be classifiable as research. Even if consistent policies have been developed, it is not clear that they are applied at departmental level.

Spin-off firms was a topic where there was only partial data. Institutions that had experience of spin-offs, where the HEI was involved with the firm through part ownership or royalty agreements, were able to provide information on numbers, employment and sometimes in equity. Few though had data on start-ups in which there was no IP agreement, nor on graduate start-ups.

Almost no information was available on equity or turnover. For many firms this was either confidential or meaningless. A firm that has recently been established and has no traded shares has no meaningful equity value, only a nominal value. This contrasts with a longer established firm that might see its shares traded at highly fluctuating values. HEIs are not in a position to monitor these figures, unless affected through their own equity investment portfolio, and in any case the figures have little direct meaning. It would seem to be inappropriate to ask HEIs to provide data on other legal entities, especially with the strict requirements of HESA.

Again there were comments from HEIs on their inability to track individual graduates, even though the questionnaire asked only for those that had completed formal graduate start-up programmes or by the direct intervention of the HEI.

Section F on training and personnel links mainly included qualitative questions, which did not present any problems, but the quantitative questions concerning the numbers of students undertaking placements and business-related courses presented some difficulties. Several institutions were unable to accurately disaggregate the different types of placement or course, and there were some definitional problems with these. The biggest problem though was an inability to identify the percentage of placement students that took up work with the employers they had worked with. This was not typically tracked, although in future it could be built into the HESA First Destination Survey thereby removing the need for HEIs to monitor this separately.

The considerable definitional problems with graduate measures were focused on issues such as how to treat part-time placements, the duration of placement, and the categorisation of employer. Several respondents presented a figure which included non-business placements, such as the NHS, as they were unable to easily disaggregate these figures.

10.5 Format

Overall, the format of the questionnaire was regarded positively by respondents. Most had a general preference for a Word document which could be emailed or made available as a download, as was done in this case. The format of the questionnaire was therefore deliberately simple to ease its use and manipulation. This experience can be contrasted with the anecdotal experience of dedicated formats such as research council and EU research proposal tools, which are disliked for their unportability, difficulty of printing and complexity of use.

Respondents were happy to have the option of return by either email or post.

The Word document option was preferred to other online forms, as the paper-based format is still useful for passing around the questionnaire internally for completion and discussion. In this sense the data requirements are still very different from HESA statistics, as they still need to be discussed and involve considerable dispersed effort rather than a more routine accounting input.

11 Recommendations for future surveys

This final section of the report focuses on detailed recommendations for future surveys.

Overall there is broad support for the collection of better information on the nature and scale of HE-business interaction. With increasing levels of involvement in the HEIs there is evidence of demand for better internal information systems to manage these activities more effectively. The currently available indicators, from published financial statistics for example, give only a very partial view of current activity, and one that is biased towards certain kinds of interaction. There is therefore a need both to further disaggregate existing data collected by HESA and to introduce the regular collection of new kinds of indicators. This survey has examined a variety of indicators and the ease with which they can be collected in future.

Enhanced data availability in the future will require greater investment from the HE sector to deliver accurate information in a more timely manner. The current survey has gained valuable information and will provide a baseline to some degree, but has been hampered in some areas by the difficulties faced by HEIs in retrieving information. In order for HEIs to commit themselves to the changes in data collection and storage needed to answer questions relevant to public policy, they need a clear statement of future data requirements. This should include specifications of what data needs to be collected and by what methodology, and an appropriate timetable for implementing the necessary changes.

Currently data are collected by three principal means and these approaches will continue in the future:

- HESA collects rigorously defined indicators on finance, students and staff on an annual basis.
- The HE funding bodies collect a mixture of qualitative and quantitative information from institutions via annual operating statements.
- There are a variety of ad hoc questionnaire surveys and other information requests.

It is important to recognise that this three-way data collection process is unlikely to change. However, a shift in the balance of which data is collected by what means, and a sharpening of the definition of some elements, would be beneficial. This would enable the better monitoring of performance and allow HEIs to better communicate the scale of their contribution. By standardising some data in a way that can be delivered through the HESA process it may be possible to reduce the impact of collecting more data by rendering the process more mechanistic, and therefore reduce the burden compared with ad hoc surveys.

Ultimately therefore we recommend that the current questionnaire approach is partly replaced by the formal collection of a limited set of hard indicators by HESA, as part of the annual financial return. This will take some time to implement, and so a questionnaire approach can be continued in the interim, but with HEIs being informed well in advance what the proposed indicators will be so that migration of information systems can be gradual. There will, however, still be a need for some form of questionnaire for more qualitative questions, and as a means for the introduction of new issues as they are deemed appropriate.

The implications of extending the set of HESA indicators are that: the data required must be tightly and unambiguously defined, must fit with current collection processes and timing, are focused on the institution only and do not refer to external bodies, and are non-confidential, as most HESA data is published at an institutional level. The main emphasis therefore will be on the disaggregation of the existing financial data provided by institutions. So the research contract and 'other services rendered' categories could be further split beyond that which is already available to provide more useful information. Information on intellectual property could also be collected by HESA, but it is suggested that only limited information on spin-off companies falls into the category, and this mainly concerns shareholdings and income from dividends and share dealing. It is not appropriate for HESA to collect data on numbers of spin-off companies or their employment and equity value, as this is not information directly concerned with the institution.

Being more specific we suggest the following, subject to full consultation and discussion within the HE sector.

Research contract financial data could be disaggregated as follows. The heading on research council/OST income could be further divided to differentiate those contracts with industrial collaboration and those without. Research contracts from UK business could be split between those with SMEs and those with other firms. The overseas research contracts could be split to show the element from business. It is not suggested that a regional breakdown is essential here, although this may be of greater priority for HE funding bodies in Scotland and Wales.

'Other services rendered' income is already disaggregated to some extent, but this could be further enhanced. One element that could be better identified is consultancy, where there are some difficulties in definition to be resolved. Income from the sale of shares in spin-off companies could be added as a discrete element. Finally the income from IP should be further investigated to see if gross incomes and costs could be separately identified, especially where third party IP management companies are used.

An additional area of data collection for HESA could be the collection of IP indicators such as disclosures, patent applications and patents granted. These kinds of indicators are already collected and monitored by a majority of HEIs using robust international standards. Those institutions that do not collect such data at present mostly have very low levels of this activity, and so the burden of collection would be very limited. Numbers involved are also not sufficiently large that sophisticated data collection system would be needed in the institutions.

In moving down this route it must be acknowledged that such data will then be published for each HEI. This is important in determining that the data should be limited to matters addressing the financial performance of the HEI only and not any other organisation linked with the HEI (such as a spin-off company). It may be that some of this information may be used to evaluate or rank institutions, but this is only an extension of existing data on research and related income and therefore already subject to this potential use. In the US the individual HEI responses to AUTM surveys are published.

Qualitative indicators and questions are still useful for other purposes of developing appropriate policies for the sector, and could be continued through an annual questionnaire that might change to a degree from year to year. It is important that such information is only published at an aggregated level as responses would be affected by any decision to publish individual HEI data.

Our interactions with individual HEIs revealed that the information systems on research grants and other interactions with industry tend to be designed to comply with the demands of HESA, but do not permit the production of more sophisticated management information. Many are currently thinking about new forms of client tracking systems and monitoring systems associated with an increased involvement in reach-out programmes such as HEROBC and HEIF. The current questionnaire has stimulated some thinking on these matters; several respondents have enquired about future information needs so that they can redesign systems accordingly. HEIs should therefore be further encouraged to invest in more detailed information systems. Often this is less a matter of redesigning the IT systems thanthe paper-based data collection systems that feed into them.

HEIs also need to take a more strategic view of some of the kinds of interactions examined in this report. Although business interaction is recognised as an important part of the mission, and is in aggregate an important source of funds, it is still managed as a marginal activity in the true meaning of that term. HEIs plan and manage their business primarily on the basis of core funding streams, with activities such as those examined in this survey treated as additional, volatile and managed on a self-contained basis. Following this logic, much of this activity is devolved, with departments only providing essential financial information to the centre of the HEI. If such activities are instead regarded as an ongoing core activity, then central monitoring would appear to be required, and more detailed information would be collected on levels of activity and beneficiaries in addition to income.

For government, the implication of the survey findings is that there is a very varied approach to business interaction, with some traditional forms of business collaboration essentially limited to very few institutions. The monitoring of patents and spin-offs requires a response from relatively few HEIs due to the extreme concentration of outputs. However, other HEIs are much more active in other forms of business interaction, such as providing services to SMEs through regeneration funds. This suggests extreme caution is needed on the setting of narrow models of business interaction, the application of few indicators, or the direction of funds to particular categories of HEIs. All HEIs can make a positive contribution to business or their local community, although some may continue to choose to focus on other objectives. It is therefore important that all HEIs are offered the opportunity to meet this challenge through additional funding for reach-out activities. The practices and performance of HEIs are affected both by the type of institution, and hence their historical endowments, and by the local business environment, as well as the management decisions taken within the HEI. The achievement of benefits for the UK as a whole and all its constituent elements will depend on an inclusive approach that recognises this diversity and supports it accordingly.

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Tables and figures

Table 1.1 Response characteristics 14
Table 3.1 Areas in which the HEI is seen as making a contribution to economic development (percentages of survey respondents) 23
Table 3.2 Areas in which the HEI is seen as making the three greatest contributions to economic development (percentages of survey respondents) 24
Table 3.3 Importance of economic development of the region in the institutional mission (universities only, percentages) 25
Table 3.4 Importance of economic development of the region in the institutional mission (percentages of survey respondents) 25
Table 3.5 Regional or local unit considered of greatest priority in the institutional mission (percentages) 26
Table 3.6 How HEIs' priority sectors were selected (percentage of different types of institution) 28
Table 3.7 How HEIs' priority sectors were selected (percentage of HEIs in each region) 29
Figure 3.1 Existence and implementation of strategic plan for business support (percentages of each grouping) 31
Figure 3.2 Involvement in the development and implementation of regional skills strategies (percentages of each grouping) 32
Figure 3.3 Incentives for staff to engage with business (percentages of each grouping) 33
Figure 3.4 Percentage business representation on the HEIs' governing bodies 34
Table 3.8 Number of staff involved in commercialisation and industrial liaison offices (percentages) 35
Figure 4.1 Growth in research grants and contracts as a percentage of total HEI income 36
Table 4.1 Research grant and contract income of UK HEIs by year and source (£millions) 37
Table 4.2 Percentage of research contract income from business that originates from the HEI's region (percentages for each grouping) 38
Figure 4.2 Income from research councils involving business collaboration (absolute values for respondent HEIs) 40
Figure 4.3 Percentage of OST/research council grant income involving collaboration with business (for respondent HEIs) 40
Figure 4.4 Income from EU Framework Programme involving business collaboration (absolute values for respondent HEIs) 41
Figure 4.5 Percentage of contracts with SMEs – percentage of HEIs of each type 42
Figure 4.6 Percentage of contracts with SMEs by value – percentage of HEIs of each type 43
Table 4.3 Number of CASE awards per HEI 1999/2000 44
Table 4.4 Number of TCS programmes 1999/2000 (percentage of each group of HEIs) 44
Table 4.5 Number of CASE studentships and TCS projects by region 45
Figure 4.7 HEIs providing equipment-related services classified by income (£) from these activities 46

Figure 4.8 HEIs providing equipment-related services classified by number of firms involved 47
Table 5.1 Whether HEIs monitor the number of invention disclosures made each year (%) 49
Table 5.2 Number of invention disclosures made in 1998/99 and 1999/2000 49
Table 5.3 Number of total UK patents filed 50
Figure 5.1 Total number of patent applications by individual HEIs 1999/2000 51
Table 5.4 Number of new UK patents filed 51
Table 5.5 Number of total UK patents granted 52
Table 5.6 Whether the HEI has an in-house capability to file patents, or uses an external agency (percentages of each type of HEI) 52
Table 5.8 Whether the HEI has an in-house capability to seek out licensing opportunities for its IP, or uses an external agency (percentages of each type of HEI) 54
Table 5.9 Number of licences/options executed on the basis of HEI-owned intellectual property over the last two years 54
Figure 5.2 Total revenues (£) from intellectual property for individual institutions 55
Figure 5.3 Total costs (£) of IP protection for individual HEIs 56
Figure 5.4 IP revenues less costs for individual institutions (£) 57
Table 5.10 Current requirement within the HEI to report the creation of the various types of intellectual property (percentage of respondents) 58
Table 6.1 Existence within the HEI of a central dedicated unit providing specific services (percentages) 60
Table 6.2 Presence of a commercialisation company or internal department to manage consulting links (percentages) 60
Table 6.3 Number of firms assisted through consulting 61
*Table 6.4 Proportion of firms assisted with consultancy that are based in the region*62
Table 6.5 Total income from consulting 62
Figure 7.1 Equity value of spin-off portfolio for individual HEIs as proportion of the total 64
Table 7.1 Support mechanisms for spin-off firms 66
Source: HEBI survey 2001. Note: A specific mechanism could be provided both by the HEI and by a partner, so row totals do not equal 100% 66
Figure 8.1 Extent to which labour market intelligence is used in planning provision (percentages of each grouping) 67
Figure 8.2 Involvement of employers in curriculum review and development (percentages of each grouping) 69
Table 8.1 Means by which placements are organised (percentages) 70
Source: HEBI survey 2001 70
Table 8.2 Existence of courses that were specifically designed to meet the needs of a particular firm or group of firms (percentage for each type of HEI) 71
Table 8.3 Provision of training for companies (percentages for each type of HEI) 71
Figure 8.3 HEIs' annual revenue from continuing education and training (£) 72
Table 9.1 Involvement in regeneration programmes (percentages for each type of HEI) 73
Table 9.2 HEIs' Income from regeneration programmes 1999/2000 74
Table 9.3 Role of regeneration programmes for the HEI (percentage response from different types of HEI) 75
Table 9.4 Role of regeneration programmes for the HEI (percentage response from different regions) 76

Table 9.5 Specific problems experienced in regeneration programmes (percentage response from each type of HEI) 77
Figure 9.1 Partnership arrangements with local and regional bodies (percentage of each type of HEI) 78
Table 10.1 Survey of burden for HEIs: sample by date of formation or entry into university sector 79
Table 10.2 Survey of burden for HEIs: sample by geographical location (region) 80
Table 10.3 Time taken to complete the questionnaire: mean and median for different types of institution (staff hours) 82

Annex A The survey questionnaire

Higher Education Funding Council for England
Scottish Higher Education Funding Council
Higher Education Funding Council for Wales
Department for Employment and Learning, Northern Ireland

C·U·R·D·S
CENTRE FOR URBAN & REGIONAL DEVELOPMENT STUDIES

Higher Education-Business Interaction Survey 1999-2000

This survey is carried out on behalf of the Higher Education Funding Councils by
Centre for Urban and Regional Development Studies
University of Newcastle upon Tyne

Purpose of the survey

This questionnaire has been designed to meet the needs of a wide-ranging group of stakeholders with interests in promoting HE-business interaction. The survey has four main objectives:

- To update previous surveys of HE-business interactions, and capture the key outputs of such interactions, taking into account differing institutional missions, strategies, capacities and expertise,
- To quantify a UK baseline to substantiate the significant level of activity which has developed in HEIs and from which improvements in later years could be measured,
- To establish and test the robustness of selected indicators which might later be deployed to inform decisions on further targeted funding for knowledge transfer activities,
- To assess the opportunity costs of the possible annual survey against the value and utility of the data collected.

The questionnaire includes a combination of quantitative and qualitative questions addressing the interactions of the HEI with business and business support activities. Some data will be obtained direct from the Higher Education Statistics Agency (such as total research income) and any questions that ask for related indicators are asked in ways that do not conflict with HESA data categories. It is anticipated that some of the quantitative data may in future be collected by HESA, and hence responses to these questions should be made with all the rigour normally expected of HESA annual returns. These include questions relating to income, patents and spin off companies. Other questions focus more on policy and may require a value judgement. It is recommended that the responses to these are discussed within the relevant unit rather than be completed by a single individual. It is expected that different units or departments may need to be consulted in order to complete all of the questions, and so the questionnaire is designed to be split up for completion, although it must be re-assembled into a single response before return.

General instructions

The questionnaire is intended to provide data for the academic year 1999-2000, and annualised quantitative data is all requested for that year, and in some cases the previous year also. Please note that the questionnaire is also seeking to establish a baseline situation in advance of the implementation of new outreach programme expenditures in the academic year 2000-2001 (such as HEROBC, or the Welsh Centres of Expertise) and therefore the situation during 1999-2000 should be taken as the present for the purposes of the questionnaire.

Responses should be made for the whole institution, although where a merger has not been fully integrated (especially where the two institutions are in different regions) then separate responses can be made. In such cases a note should be added on the coverage of the response.

Please do not leave any question blank. If the answer to a question is zero or negligible then please enter "0". If data are not available then enter "n.d." or if not applicable then "n.a.". If a figure is an estimate then please write "e" alongside it.

Confidentiality

The completed questionnaires will be coded and used for analysis by CURDS and the aggregate results published by HEFCE on behalf of all of the Funding Councils. No individual HEI responses will be published, except by prior permission in exceptional cases. Data will not be released in any way that permits ranking of institutions. The data set will be the property of the Funding Councils on completion of the analysis, and may be used in future years to monitor changes at the level of the sector as a whole and for individual institutions.

Response Contact

Institution and coverage ....

Contact name ....

Job Title ....

Full postal address ....

....

....

Telephone ....

Fax ....

Email ....

Please return by March 31st to:

Cheryl Conway
Centre for Urban and Regional Development Studies
University of Newcastle
Newcastle upon Tyne
NE1 7RU

If you have any questions about this questionnaire then please contact any of the following:

Dr David Charles	0191 222 7692	d.r.charles@ncl.ac.uk
Cheryl Conway	0191 222 7577	c.d.conway@ncl.ac.uk

This questionnaire is available as a Word file, at http://www.ncl.ac.uk/unireg/hefce/hefce.htm

A. Institutional strategy and economic development

A1. In what areas do you see the HEI as whole making the greatest contribution to economic development *(please tick all those appropriate and indicate which are the top three)*?

	Appropriate	Top three
• Access to education	☐	☐
• Graduate retention in local region	☐	☐
• Technology transfer	☐	☐
• Supporting SMEs	☐	☐
• Attracting inward investment to region	☐	☐
• Research collaboration with industry	☐	☐
• Strategic analysis of regional economy	☐	☐
• Attracting non-local students to the region	☐	☐
• Support for community development	☐	☐
• Developing local partnerships	☐	☐
• Management development	☐	☐
• Meeting regional skills needs	☐	☐
• Meeting national skills needs	☐	☐

A2. Does the HEI have a strategic plan for business support? Please indicate on a scale from 1-5 which of the following statements most closely accords with your state of implementation in 1999-2000. (E.g. if between the first and middle statement the answer is 2. Record the score in the box below the table)

1	2	3	4	5
No strategic plan in place. Ad hoc approach to business support		Strategic plan developed and only partially implemented, or restricted to certain departments or central functions only		Strategic plan developed as a result of an inclusive process across the whole HEI. Accepted across almost all units and recommendations implemented. Use of plan to set targets and monitor achievement.

☐

A3. Does the HEI set out to work more closely with particular business sectors or clusters such as aerospace, agriculture or biotechnology? If so please list priority sectors (highest priority first).

A4. If you answered question A3, please indicate how these priority sectors were determined (tick all boxes that apply).

- The HEI is a specialist institution focused on sector specific areas ☐
- The HEI took its cue from priorities in RDA regional strategies ☐
- Response to demand from companies in these sectors ☐
- The HEI identified important business clusters in its region ☐
- These sectors had best fit with the institution's expertise ☐
- The HEI focused on a 'gap in the market' left by other HEIs ☐
- Other (please specify) ☐

A5. Is the HEI involved in the development and implementation of regional skills strategies in terms of the provision of expertise and data and the involvement of senior HE staff in regional partnerships? Again please indicate on a scale from 1-5 which of the following statements is appropriate for 1999-2000.

1	2	3	4	5
Passive response to skills strategies. No involvement in steering committees, no provision of data or expertise. No attempt to influence or respond to strategy during consultation.		Some engagement with regional partners and provision of expertise and data, but approached as a narrow sectoral interest. Involvement from officers with defined role rather than leadership inputs.		Pro-active engagement providing expertise data, interpretation and leadership inputs. HEI seen as a core asset in the region and becomes a central element within the strategy

☐

A6. Is there business representation on your governing body?

Number of members on governing body	
Number that are from business	

A7. In the context of your overall institutional mission, what importance would you attach to the economic development of your region?

- High priority ☐
- Medium priority ☐
- Low priority ☐

A8. Which of the following regional/local units is of greatest priority in your university's institutional mission?

- Regional/local area not of any significance to mission ☐
- RDA area (ie East Midlands, South West) ☐
- Local authority area (county or unitary) ☐
- Locality – city or town ☐
- Area defined by the University (e.g. surrounding counties especially if crosses regional boundaries or is multi-county) ☐

Please provide a written description of what you consider to be your local region as indicated above. If this is specified in your institutional plan or other formal documentation then please provide this definition.

A9. How would you rate the level of incentives for your staff to engage with industry and commerce? (Please grade your institution on the following scale from 1-5 for the situation during 1999-2000)

1	2	3	4	5
Barriers outweigh any incentives offered. General corporate culture is focused on internal activities and narrow interpretation of teaching and research. Collaboration with industry seen by staff as detrimental to career progression.		Some incentives in place, but with some barriers remaining. Typically policy may be generally supportive but there is a lack of understanding across the institution. Promotions committees still take a narrow focus on research even though guidance suggests industrial collaboration is valued equally.		Strong positive signals given to all staff to encourage appropriate levels of industrial collaboration. Incentive procedures well established and clearly understood and applied.

☐

B. Collaborative research with business

B1. What was the HEI's income from public sector funded collaborative research grants involving business co-funding or formal collaboration? *(NB Please exclude income from any project that does not involve direct business participation in the form of part sponsorship or direct collaboration - e.g. mainstream response mode research council projects without business partners, or EU FP projects with no industrial partners)*

	1999-2000
Research councils	
OST	
EU Framework Programme	
Other	

B2. What was the HEI's income from contract R&D originating from partners located in the same region, within the UK and from outside the UK?

These contracts exclude responsive mode grants for research made by educational charitable bodies (such as the Wellcome Trust or Leverhulme Trust) and public agencies, but focus on studies and projects commissioned by the client body to underpin their own objectives.

The region is defined as the English RDA region, Scotland, Wales or Northern Ireland. National covers the whole UK, excluding that already reported under region. Contracts with Whitehall government departments should always be included as national, although contracts with devolved administrations or regional government offices should be included as regional unless the HEI is in different region. HEIs with substantial campuses in two regions should consider both regions as the home region, although if one campus is simply a teaching outpost lacking significant research generation activity then that region should be considered as outside the home region.

1999-2000	Regional	National	Non-UK	Total
Direct contracts with commercial organisations				
Direct contracts with private non-profit bodies				
Direct contracts with public sector bodies				

B3. Approximately what percentage of contracts with businesses by number and value during 1999/2000 were with SMEs (less than 250 employees and not part of bigger enterprise groupings)

% contracts by number	% contracts by value

B4. How many CASE awards did the HEI hold (number of students funded) and for how many was the partner within the same region.

	1999-2000
Total number of CASE awards	
Number with partners in the same region	

B5. What were the number of Teaching Company Programmes and Teaching Company Associates, and what proportion were with firms within the same region?

	1999-2000
Total Teaching Company Programmes	
Total Teaching Company Associates	
Teaching Company Programmes with regional partners	
Teaching Company Associates with regional partners	

B6. Does the HEI provide equipment-related services for industry, such as analysis, measurement and testing?

Yes ☐ No ☐

What was the total income in 1999-2000 from the provision of such services - to regional firms, UK wide and foreign? How many firms are involved at each scale?

	Regional firms	UK wide	Foreign	Total
Income 1999-2000				
Numbers of firms involved				

C. Intellectual Property

C1. Do you monitor the number of invention disclosures made each year?

Yes ☐ No ☐

C2. If yes, how many disclosures have been made in each of the last two years?

1998-99		1999-2000	

C3. Does the HEI exert ownership over intellectual property by filing patents?

Yes, patents filed by the HEI in-house ☐
Yes, patents filed on behalf of the HEI by another organisation ☐
No action taken ☐

C4. How many patents have been filed by or on behalf of the HEI in each of the last two years? (NB Count as one patent either a UK patent or a European patent, but do not count multiple filings of the same patent in different countries)

	1998-99	1999-2000
Number of total UK patents filed		
Number of new UK patents filed		
Number of UK patents granted		

C5. Does the HEI have an in-house capability to seek out licensing opportunities for its IP, or does it use an external agency? (please indicate the principal method only)

Yes, in-house capability ☐
Yes, external agency ☐
No action taken ☐

C6. How many licences/options have been executed on the basis of HEI-owned intellectual property over the last two years? (excluding software and biological material end user licences under £1000)

Non-software licences	1998-99	1999-2000
Licences granted to UK based companies		
Licences granted to companies based overseas		

Software licences only	1998-99	1999-2000
Licences granted to UK based companies		
Licences granted to companies based overseas		

C7. What have been the total revenues from IP (including royalties on patents, copyrights etc but excluding software and biological material end user licences under £1000)

1998-99		1999-2000	

C8. What were the total costs of IP protection activities? (including specialist staff, consultancies, patent costs and legal fees)

1998-99		1999-2000	

C9. Is there a requirement within the HEI to report the creation of the following types of intellectual property

	Always	Usually	Rarely/Never
Inventions	☐	☐	☐
Computer software or databases	☐	☐	☐
Literary or artistic works	☐	☐	☐
Educational software and multimedia	☐	☐	☐
Industrial designs	☐	☐	☐
Trademarks	☐	☐	☐
Integrated circuit topographies	☐	☐	☐
New plant or animal varieties	☐	☐	☐

C10. How are intellectual property management activities usually initiated in cases of new intellectual property?

- The discoverer/researcher reports the discovery to the institution and requests consideration for protection and/or commercialisation ☐
- The institution monitors the activities of the researchers and notes which discoveries should be considered for protection and/or commercialisation ☐
- Other (please specify) ☐

C11. Are individuals rewarded by the institution for their intellectual property?

Yes ☐ No ☐

If so, what percentage of net revenues is given to inventors if cumulative income exceeds £100,000? (please explain policy briefly)

C12. Please append any policies in effect that influence the management of intellectual property.

D. Consulting activities

D1. Does the HEI have a central dedicated unit which provides the following:

An enquiry point for SMEs ☐
Assistance to SMEs in specifying their needs ☐
A required contracting system for all staff-business consulting activities ☐
Indemnity insurance for staff ☐

D2. How many firms have been assisted through consulting activities and what percentage have been based in the region?

	1998-99	1999-2000
Number of firms assisted through consulting activities		
Percentage based in the region		

D3. What has been the total income from consulting handled through formal HEI channels (includes individual payments direct to staff where known)?

1998-99		1999-2000	

D4. Does the HEI have a commercialisation company or department to manage consulting links and other external interactions?

No ☐ Yes, exploitation company ☐ Date established …………
Yes, internal department ☐

D5. How many staff are employed in commercialisation and industrial liaison offices? (full time equivalents)

☐

E. Spin off firms

'Spin offs' are enterprises, in which an HEI or HEI employee(s) possesses equity stakes, which have been created by the HEI or its employees to enable the commercial exploitation of knowledge arising from academic research. Other 'start-up' companies may be formed by HEI staff or students without the direct application of HEI-owned intellectual property.

Four types of spin off or start up firms can be defined:

- Spin off companies established using HEI intellectual property and in which there is some element of HEI ownership
- Spin off companies into which the HEI has assigned or licensed IP, but in which it has no equity
- Start-up companies involving current or former university staff as founders where the university has no ownership nor an IP agreement (in this case the HEI staff must be connected to the HEI immediately prior to formation of the company)
- Graduate start-up companies that have originated through the direct involvement off the HEI or through a dedicated graduate start-up programme.

E1. In the following table please insert the required information concerning each of these groups of firms.

	Number established 1999-2000	Number established in previous five years (1994-95 to 1998-99	Estimated current employment of firms in columns A and B together	Estimated current turnover of firms in columns A and B together	Estimated equity value of firms in columns A and B together
Spin offs with some HEI ownership					
Formal spin offs, not HEI-owned					
Staff start ups					
Graduate start ups					

E2. For the case of companies part owned by the HEI, please provide an estimation of the total equity value of the portfolio? (including companies established before 1994 if relevant). Please provide only the HEI owned share of equity value.

£

E3. What has been the income to the HEI from the sale of shares in spin off companies during 1999-2000?

£

E3. Does the HEI provide support for spin offs through the following mechanisms, either provided by the HEI or in collaboration with a partner organisation? (You may tick both column one and two if appropriate)

	HEI provided	Partner provided	None
• On campus incubators	☐	☐	☐
• Other incubators in the locality	☐	☐	☐
• Science park accommodation	☐	☐	☐
• Entrepreneurship training	☐	☐	☐
• Seed corn investment	☐	☐	☐
• Venture capital	☐	☐	☐
• Business advice	☐	☐	☐

F. Training and personnel links

F1. To what extent does the HEI monitor skills needs and sectoral change though labour market intelligence (LMI), and take this into account in planning provision? (Please grade your institution on the following scale from 1-5 for 1999-2000)

1	2	3	4	5
No monitoring of skills, general use of LMI, or collaboration with employers		Moderate responsiveness – some changes in provision based on forecasting of demand using LMI, but little ongoing dialogue with employers and other bodies. LMI would typically be examined in central service units but not disseminated and used in departments.		Sophisticated monitoring systems at HEI level, with provision of appropriate data to individual departments. Evidence that information from LMI and employer suggestions are acted upon at central and departmental levels.

F2. To what extent do individual courses actively involve employers in the development of content and regular reviewing of the curriculum? (Please grade your institution on the following scale from 1-5 for 1999-2000)

1	2	3	4	5
No links with employers in development of locally oriented courses or overall shaping of the curriculum		Some dialogue with employers and other bodies about the nature of courses, but limited e.g. to specific vocational areas, or one-off exercises.		All departments regularly consult with employers and other partners on curriculum where relevant. Specialist subjects are kept up to date and relevant to the labour market. More generic skills developed in all courses as required.

F3. How many undergraduates undertake placements in business?

Type of placement	Numbers of students involved 1999-2000	% of participants which find work with these employers after graduation
1 year sandwich placements		
Shorter placements required for course		
Optional placements organised by the HEI		
Other		
Total		

F4. How are these placements organised? (Please tick all that apply).

Via a central placement department ☐
Individual school or department level ☐
Via careers service ☐
Via students union ☐
Ad hoc between students and businesses ☐
Via external intermediary organisation (please specify) ☐

F5. Does your institution run courses that were specifically designed to meet the needs of a particular firm or group of firms?

	Yes	Numbers of students 1999-2000
Undergraduate degree modules	☐	
Undergraduate degree	☐	
Masters degree	☐	
Diploma	☐	
Non-accredited course	☐	

F6. Does your institution provide the following?

Distance learning for businesses ☐
Continuous work-based learning ☐
Short bespoke courses for business on campus ☐
Short bespoke courses at companies' premises ☐

F7. What was the revenue for 1999-2000 from the provision of continuing education and training to companies?

£

G. Regeneration activity

G1. Has the HEI received funding from any of the following programmes in the last 2 years?

- European Regional Development Fund ☐
  (Objective 1 or 2 areas, Regional Challenge)
- EU Community Initiatives ☐
  (i.e. ERDF/ESF thematic programmes such as RECHAR, RETEX, KONVER, ADAPT, HORIZON)
- European Social Fund ☐
- Single Regeneration Budget ☐
- City Challenge ☐
- DfEE Higher Education Regional Development Fund/
  Skills Development Fund ☐
- Other local economic development programmes ☐
  (Please provide names of programmes)

G2. What was your income from various regeneration and regional development programmes in 1999-2000?

ERDF income (revenue projects)

Innovation support activities	
General business support activities	
Community support	
Other	

ERDF income (capital)

Innovation support activities	
General business support activities	
Community support	
Other	

ESF income

Direct support to business	
Support to individuals	

Single Regeneration Budget and related central government regeneration programmes

Revenue	
Capital	

Other regeneration grants and income from local and regional bodies

G3. What role do these programmes play for the HEI? *(Please tick all those that are appropriate and the three most important roles)*

	Appropriate	Top three
Additional funds for teaching, training	☐	☐
Additional funds for research	☐	☐
Enabling capital projects - new building/ accommodation	☐	☐
Acquiring research equipment (used also by industry)	☐	☐
Building strategic links with local industry	☐	☐
Fulfilling regional mission through new services to industry	☐	☐
Facilitating partnerships	☐	☐
Enhancing knowledge of labour market needs	☐	☐
Enhancing redesign of curriculum	☐	☐
Facilitating community development	☐	☐
Other (please specify)	☐	☐

G4. Have you experienced any specific problems in these programmes? *(Please tick all those reasons that apply)*

- Administrative burdens ☐
- Matching funds requirements ☐
- Timing of bidding process ☐
- Difficulties of partnership management ☐
- Inadequate funding rates ☐
- Eligibility rules ☐
- Co-ordination problems internal to the university ☐
- Other *(please specify)* ☐

G5. Which of the following statements best describes your partnership arrangements with local and regional bodies? (Please grade your institution on the following scale from 1-5)

1	2	3	4	5
No engagement with community regeneration schemes, apart from individual efforts.		Some representation of the HEI on local partnerships at senior management level, but with limited implementation capability. Main focus is on research role and possible property development role.		Active and creative engagement with community programmes, with the HEI taking a leadership position and applying a wide variety of resources. Community regeneration seen as a mainstream activity with role for access policy, link to student community action and staff involvement as part of staff development.

H. Questionnaire administrative information

H1. Approximately how much time was spent in completing this questionnaire, and what do you estimate was the cost to your institution?

H2. Were any of the questions impossible to answer due to the unavailability of data? (if so, which ones and why?)

H3. Were any of the questions difficult to answer without an excessive degree of additional analysis? (If so, which ones and why?)

H4. Which format of questionnaire and reply format would be most useful to you? (Paper form, Word document, Excel sheet, Webform, Postal return, Disk return, Email return)

Please return the completed questionnaire to CURDS, University of Newcastle, Newcastle upon Tyne, NE1 7RU

Acronyms

AUTM	Association of University Technology Managers
BTG	British Technology Group
CASE	Co-operative Awards in Science and Engineering (postgraduate studentships)
CR	Contract research
CURDS	Centre for Urban and Regional Development Studies, University of Newcastle upon Tyne
CVCP	Committee of Vice-Chancellors and Principals (now Universities UK)
DEL	Department of Employment and Learning (Northern Ireland)
DfEE	Department for Education and Employment (now the DfES)
DfES	Department for Education and Skills
ERDF	European Regional Development Fund
ESF	European Social Fund
ESRC	Economic and Social Research Council
HE	Higher education
HEED	Higher Education Economic Development Fund
HEFCE	Higher Education Funding Council for England
HEFCW	Higher Education Funding Council for Wales
HEI	Higher education institution
HEIF	Higher Education Innovation Fund
HEROBC	Higher Education Reach-out to Business and the Community Fund
HESA	Higher Education Statistics Agency
IP	Intellectual property
NRDC	National Research and Development Corporation
OST	Office of Science and Technology
RDA	Regional Development Agency
SCOP	Standing Conference of Principals
SEC	Science Enterprise Challenge
SHEFC	Scottish Higher Education Funding Council
SMEs	Small and medium enterprises
SRB	Single Regeneration Budget

TACS	Training and consultancy services
TCS	*Teaching* Company Scheme
UC	University Challenge fund
WDA	Welsh Development Agency

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